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PROGRAM DEVELOPMENT CENT. (U) TRAINING ANALYSIS AND  
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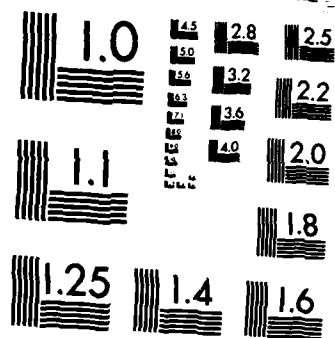
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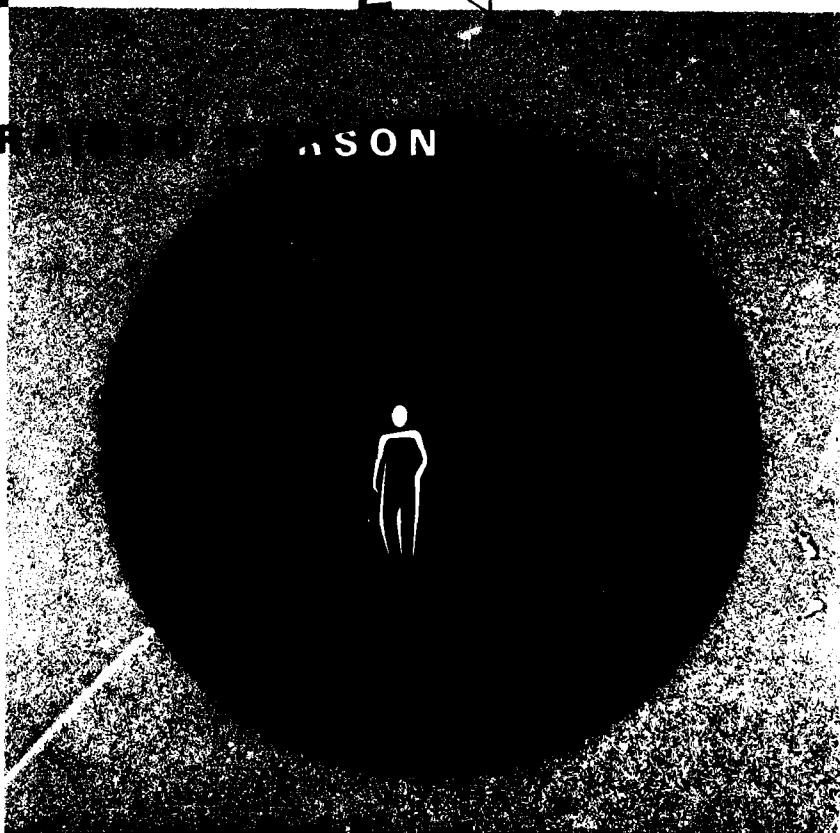
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**THE LONG-RANGE ROLE AND  
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PROGRAM DEVELOPMENT  
CENTERS: ECONOMIC  
ASSESSMENT**

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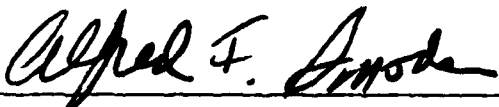
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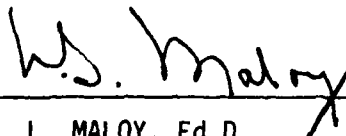
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|---|--------------------------------------|--|
| 1. REPORT NUMBER<br>TAEG Report No. 103   | 2. GOVT ACCESSION NO.<br>AD-A152 925 | 3. RECIPIENT'S CATALOG NUMBER                                  |
| 4. TITLE (and Subtitle)<br>THE LONG-RANGE ROLE AND MISSION OF INSTRUCTIONAL<br>PROGRAM DEVELOPMENT CENTERS: ECONOMIC<br>ASSESSMENT  |                                      | 5. TYPE OF REPORT & PERIOD COVERED                             |
|   |                                      | 6. PERFORMING ORG. REPORT NUMBER                               |
| 7. AUTHOR(s)<br>William M. Swope and F. Laurence Keeler   |                                      | 8. CONTRACT OR GRANT NUMBER(s)                                 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>Training Analysis and Evaluation Group<br>Orlando, FL 32183  |                                      | 10. PROGRAM ELEMENT, PROJECT, TASK<br>AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS   |                                      | 12. REPORT DATE<br>June 1981                                   |
|   |                                      | 13. NUMBER OF PAGES<br>67                                      |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)   |                                      | 15. SECURITY CLASS. (of this report)<br><br>Unclassified       |
|   |                                      | 15a. DECLASSIFICATION/DOWNGRADING<br>SCHEDULE                  |
| 16. DISTRIBUTION STATEMENT (of this Report)<br><br>Approved for public release; distribution is unlimited   |                                      |  |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)  |                                      |  |
| 18. SUPPLEMENTARY NOTES   |                                      |  |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br>Instructional Systems Development, <i>Manpower Utilization,</i><br>Instructional Program Development, <i>Productivity,</i><br>Cost-Benefit Analysis, <i>Cost Effectiveness,</i><br>Economic Analysis, <i>Training.</i>                                |                                      |  |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>The purpose of this study was to provide empirically-based factors which could<br>be used to develop a realistic long-range plan for the orderly implementation<br>and efficient management of the Navy's Instructional Program Development<br>effort. |                                      |  |

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20. Abstract (continued)

→ The specific objectives were:

- . document the resources expended by functional areas of the ISD model;
- . identify factors, contingencies, and problems encountered in the IPD effort which impact on efficiency;
- . provide an objective data base from which productivity estimates can be derived for planning;
- . provide data which can be used to aid in developing a more cost-effective management plan for future IPD efforts;
- . identify areas which could be investigated as to the feasibility for improving efficiency and operation of the IPDC effort.

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### SECTION I

#### INTRODUCTION

The Navy formally implemented Instructional Systems Development (ISD) in July 1976 with the establishment of an Instructional Program Development Center (IPDC) at San Diego. Since that date, considerable resources have been committed to the Navy's IPD effort.

There has been continuing concern about the efficiency and effectiveness of the IPDC network and a recognized need for a long-range plan. Consequently, the Training Analysis and Evaluation Group (TAEG) was tasked by the Chief of Naval Education and Training (CNET) to investigate the long-range role of the IPDC in the outyears. The tasking stated that "particular attention should be paid to the class 'C' and 'F' schools and to the cost effectiveness of the current and planned IPD center network."<sup>1</sup> Neither the cost effectiveness of the ISD process nor the adequacy of the IPDCs performance was the central issue of the study.

The task was divided into two phases. Phase I documented the costs, output, and problems of the IPDCs from their establishment in 1976 through September 1980. Phase II of the study addressed issues dealing with the improvement and efficiency of the IPD effort. Data from both efforts will support the development of a command-wide plan for developing and maintaining instructional material for all "A," "C," and "F" courses.

This report is the phase I study. Detailed analyses emphasize the economic aspects of the course development and implementation process as it occurred between July 1976 and September 1980. The study results also provide inputs to the phase II effort. The phase II effort will be reported in a separate document. Work on the project began in mid-1980 but was delayed in order that the analysis could include all of the FY 80 data. The FY 80 data was received in December 1980.

#### PURPOSE

The purpose of the present study was to provide empirically-based factors which could be used to develop a realistic long-range plan for the orderly implementation and efficient management of the Navy's IPD effort. Specific objectives were:

- . document the resources expended by functional areas of the ISD model
- . identify factors, contingencies, and problems encountered in the IPD effort which impact on efficiency
- . provide an objective data base from which productivity estimates can be derived for planning

<sup>1</sup> CNET (N-53) tasking ltr of 21 Feb 1980, subj: Tasking for a study of the long range role and mission of Instructional Program Development Centers (IPDC's).

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- provide data which can be used to aid in developing a more cost-effective management plan for future IPD efforts
- identify areas which could be investigated as to the feasibility for improving efficiency and operation of the IPDC effort.

### BACKGROUND

The CNET in January 1975, directed a study group to develop a plan for the full implementation of ISD using a centralized management concept. This study group developed and published a comprehensive plan<sup>2</sup> (subsequently called the "Blue Book") which set forth an approach for implementing the ISD procedure, published as NAVEDTRA 106A.

The comprehensive plan called for the ultimate establishment of five IPDCs to develop instructional programs for all NAVEDTRACOM courses. The Blue Book provided a plan for the management and organizational structure of the five IPDCs and an orderly procedure for the transition of course curriculum development and maintenance into the IPD program over a 12-year period. The Blue Book called for a two phased effort. During phase I, the ISD process was to be applied to the 193 high-volume indoctrination and basic skill courses. Phase II called for the application of ISD to the remaining 2,000 plus courses representing advanced skill training and system-specific courses.

This plan was based upon a set of assumptions and constraints on resource availability and productivity rates. These assumptions were derived from data obtained from previous ISD-like efforts in CNET and from industry experience. The funding requirements for the plan represented an estimate of resources required for full implementation of the CNET decision to utilize the ISD procedures and to phase in all course development into the IPD effort.

The CNET decision to implement the ISD program was supported by three economic analyses performed between November 1975 and July 1977.<sup>3,4,5</sup> These analyses were based upon a number of tentative assumptions dealing with the rate and resources required to develop course curricula using the ISD model.

<sup>2</sup>Chief of Naval Education and Training Support memorandum 01A:ELL of 11 Aug 1975, subj: Plan for the Implementation of ISD in NAVEDTRACOM.

<sup>3</sup>Economic Analysis of the Instructional Systems Development Plan, TAEG Technical Memorandum 75-6, 3 November 1975. Training Analysis and Evaluation Group, Orlando, FL 32813.

<sup>4</sup>Morris G. Middleton, William M. Swope, William C. Rankin, Eric K. Green, and William F. Parrish. Cost/Benefit Analysis of the Instructional Systems Development Implementation Plan (FY 77 to FY 82). TAEG Technical Memorandum 76-7, November 1976. Training Analysis and Evaluation Group, Orlando, FL 32813.

<sup>5</sup>William M. Swope and Eric K. Green, Cost/Benefit Analysis of the Instructional Systems Development Plan. TAEG Technical Memorandum 77-6, July 1977, Training Analysis and Evaluation Group, Orlando, FL 32813.

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These analyses generally demonstrated that the Naval Education and Training Command (NAVEDTRACOM) plan for implementation of the IPD effort would indeed result in a reduction of total training costs, especially for the first few years when the high throughput courses were brought under development.

A number of assumptions were necessary for the above economic analyses and these were fully documented in the referenced technical memorandums. Two of the most crucial assumptions which impacted heavily on the conclusions drawn from the economic analyses were: (1) each fully funded IPDC would be able to develop 1,000 hours of instructional material per year and (2) courses developed using the ISD process would result in an average 10 to 15 percent reduction in student training time. The previous economic analyses did not address the question of differential training effectiveness resulting from the application of the highly structured ISD process. It was assumed that training effectiveness would be at least equal to or "better" using the IPD-developed materials. Using the latter assumption, it was demonstrated that it would be economically efficient to adopt the proposed IPD implementation plan. This conclusion was justified entirely on the basis of the projected saving of student training time.

Experience to date, although limited, indicates that some of the assumptions made in the previous analyses are not tenable. For example, the time required for developing course curricula using the highly structured ISD process is much greater than anticipated. Also, indications are that in the long run the application of the ISD process may not lead to an average reduction of 10 to 15 percent in student time primarily because of the need to add new material to the revised course to satisfy validated task requirements. The economic feasibility of the highly structured ISD process must depend on demonstrating that the application of this process leads to "more relevant" or more effective training. Whether or not the potential benefits which might be derived from more effective training are worth the additional costs is a management decision.

Curriculum development is a necessary part of training. There is no essential agreement on just how and where that development should be organized and completed. The ISD procedures represent an orderly process for developing curriculum, but where that development is to be done and by whom are not addressed in the ISD model. The implementation of the ISD model can occur on a continuum represented at one end by a highly decentralized developmental effort concentrated at the school. The other end of the continuum is represented by a highly structured organization where resources are devoted exclusively to developing curriculum using the ISD models. Prior to the IPD effort the Navy depended on the local training organization to develop its own training program and curriculum. The products often were judged inadequate and suspected of not providing the most cost-effective training. Local curriculum development costs appeared to be low; however, these costs were usually confounded with other training costs which makes it difficult to isolate the unique curriculum development costs.

In 1976, with the formalization of the IPD effort in the IPDCs, the Navy moved toward a highly structured organizational approach to implementing ISD. To date, the productivity and effectiveness of these IPDCs are less than anticipated. A part of these deficiencies may result from inefficiencies

inherent in the implementation of any new and untried program. However, because of the complexity of a full-scale curriculum development program, it may simply be more expensive to develop curriculum than originally anticipated. In addition, when curricula are developed in an organization devoted entirely to that purpose then costs incurred are fully exposed, identifiable, and become totally incremental for that decision.

It is difficult to determine how much more expensive, if any, a curriculum developed at an IPDC is over a similar curriculum developed on a more ad hoc basis at the schoolhouse. This difficulty can be attributed to two major factors. First, it is almost impossible to establish unambiguously total curriculum development costs at the schoolhouse because so many of the resources required for curriculum development are jointly used for other parts of the training program. To estimate total curriculum development costs would require one to allocate these joint overhead costs among the various training functions.

Fortunately, management decisions regarding curriculum development costs do not require one to estimate total costs at the schoolhouse. The appropriate and relevant cost information required by management is the incremental costs; i.e., how costs will change if the curriculum development function is added or removed from the schoolhouse. Therein lies the second difficulty. To estimate incremental costs it is necessary to determine the value in alternative uses (opportunity costs) of the resources which are currently devoted to curriculum development. The problem of estimating costs for individuals who develop curriculum is especially difficult. Many of these individuals have other duties and removing their responsibility for curriculum development often will not eliminate their billets because of these additional duties. For example, an instructor may be required to be onboard even though he teaches only 50 percent of the time. If he is presently doing curriculum development then his time may, in fact, be "free" when computing the economic development costs. If the curriculum development function is removed, he may be forced to do trivial or nonproductive work to fully utilize his time.

#### APPROACH

As indicated earlier, TAEG was tasked to examine the question of which most efficient and effective organizational and management structure for continued implementation of a highly structured IPD capability within the Navy. A return to the pre-ISD/IPDC status quo was not considered an option. Since the tasking explicitly stated that "particular attention should be paid to class 'C' and 'F' schools and to the cost-effectiveness of the current and planned IPD center network,"<sup>6</sup> it was necessary to examine the past performance of the IPDCs in terms of the utilization of resources and the rate at which instructional material was being developed. This examination involved an analysis of the cost and manpower data bases being maintained by the IPDCs and other empirical data collected directly from the IPDCs.

Visits were made to the major IPDCs to obtain a qualitative summary of problems which impact on the productivity of each center. Situation summaries,

<sup>6</sup>OP cit. CNET N-5 tasking ltr of 21 Feb 1980.

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TABLE 8. PERCENTAGE DISTRIBUTION OF ALL IPDC TIME AMONG THE ISD FUNCTIONS--SAN DIEGO (1976 to 1980)

| Function       | 1976* | 1977 | 1978 | 1979 | 1980* |
|----------------|-------|------|------|------|-------|
| Administration | 59.5  | 59.5 | 55.5 | 57.0 | 53.0  |
| Analyze        | 20.8  | 15.5 | 16.8 | 11.8 | 4.5   |
| Design         | 3.5   | 3.1  | 3.6  | 6.3  | 5.3   |
| Develop        | 5.5   | 11.0 | 15.4 | 16.1 | 26.3  |
| Media          | 0.5   | 7.2  | 3.7  | 4.7  | 6.7   |
| Evaluation     | 0.0   | 0.7  | 2.1  | 1.9  | 3.0   |
| Training       | 9.9   | 2.5  | 2.5  | 1.8  | 0.9   |

\*Not a full year

TABLE 9. PERCENTAGE DISTRIBUTION OF IPDC TASK TIME ASSIGNED TO THE ISD FUNCTIONS - SAN DIEGO (1976 to 1980)\*

| Function       | 1976 | 1977 | 1978 | 1979 | 1980 |
|----------------|------|------|------|------|------|
| Administration | 19.6 | 19.3 | 21.6 | 17.1 | 15.3 |
| Analyze        | 54.6 | 32.5 | 31.3 | 23.6 | 8.3  |
| Design         | 9.5  | 6.7  | 6.8  | 12.6 | 9.6  |
| Develop        | 14.8 | 23.1 | 28.6 | 32.3 | 48.3 |
| Media          | 0.6  | 15.0 | 6.9  | 9.4  | 12.3 |
| Evaluation     | 0.0  | 1.6  | 3.9  | 3.8  | 5.5  |
| Training       | 0.6  | 1.5  | 0.5  | 0.9  | 0.4  |

\* Excludes time assigned to nonIPD functions, leave, and nonidentified tasks.

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to tasks supporting that rating. If for any pay period the equivalent number working on the task exceeded nine individuals then the number was coded with an appropriate symbol as given in the legend on the figure. For example, during the last pay period shown in 1980, the equivalent of four individuals were working on the RT rating, three on the SA rating, one on the GT rating, nine on the HT rating, four on the EO rating, nine on the RM rating, and four on the IC rating. The ST and DP ratings were coded as an "A" which indicated that the equivalent of 11 to 19 individuals were working on each of these ratings. Finally, the last row, "OH" is the administrative overhead. The time attributed to administration during the last period shown was coded as "D" which indicated that there was the equivalent of 40 to 49 individuals assigned full time to the administration functions/duties. This figure illustrates the distribution of the work effort over the period illustrated and shows which ratings were being emphasized in each pay period (in terms of the IPDC's work effort) over the entire life of the center. During 1979 there were more tasks underway than for any of the other years as indicated by the number of tasks to which manpower was allocated.



The distribution of labor among the IPDC functions, as a percent of the total available to the IPDC, is shown in table 8. In each year more than half of the available time was assigned to functions classified as administration. There has been a steady decrease in the percentage (of the total time available) which has been attributed to analysis and a steady increase in the percentage attributed to development. This change in emphasis can, with a high probability, be attributed to the phasing of work under development. The San Diego IPDC has not been in existence long enough to attain a steady state in the composition and phasing of tasks under the various stages of ISD. In the long run, the distribution of work among the ISD phases in the IPDC may prove to be cyclical as new tasks are phased in and others completed.

The major reason that so much of the IPDCs time has been assigned to administration arises from the large amount of time attributed to nonIPD and nonidentified tasks. Most of the time attributed to these latter two categories was assigned to the administrative function. If the nonIPD functions, leave, and nonidentified tasks are excluded from the distribution of time, then the amount of total administrative time used in support of the assigned tasks varies from a high of 21.6 percent in 1978 to a low of 15.3 percent in 1980 (table 9).

The trend in administration as a percent of all IPDC time is illustrated in figure 1. The figure shows the trend in administration time used in direct support of the assigned IPD tasks. There appears to be a slight downward trend in percent of total time devoted to administration.

Given a fixed labor base, the rate at which the IPDCs can develop the courses assigned for ISD will be affected by the proportion of time allocated to the nonIPD and nonidentified tasks, especially if those tasks are not in support of the courses assigned the IPDC for development. In 1976, 50 percent of the total IPDC time was assigned to other nonIPD or nonidentified tasks (table 10). There has been a fairly steady decline in this percentage since the establishment of the IPDC as illustrated in figure 2. In 1980 an estimated 34 percent of the time was devoted to nonIPD and nonidentified tasks.

The distribution of time among the functions for a selected set of ratings is shown in appendix B (tables B-1 through B-7). The man-hour and percentage of the total time assigned during each two week period over the life of the project is displayed in the appendix tables. As expected, most projects have a large percentage of project time assigned to administration during the first few accounting periods. Analysis tends to be heavy during the beginning periods of the task, but it also appears that during the life of most projects that there are subsequent periods when a significant part of the effort is shifted back to analysis. The phasing of the work effort among the ISD blocks seems to have occurred in a fairly linear sequence for most tasks presented in appendix B.

A distribution of the work effort over the various ratings assigned to the San Diego IPDC is shown in figure 3. The distribution is shown by each two-week pay period starting from the 12th pay period in 1976 and ending with the 20th pay period in 1980. The vertical columns at each pay period indicate the equivalent number of employees (or man-periods) working on tasks associated with each of the ratings. Each man-period represents 80 hours of time assigned

TABLE 7. MAN-HOURS ATTRIBUTED TO EACH ISD FUNCTION AT THE  
SAN DIEGO IPDC (1976 to 1980)

| Year  | Administration | Analyze | Design | Develop | Media  | Evaluation | Training | TOTAL     |
|-------|----------------|---------|--------|---------|--------|------------|----------|-----------|
| 1976* | 36,065         | 12,654  | 2,149  | 3,352   | 326    | 0          | 6,006    | 60,552    |
| 1977  | 145,423        | 38,025  | 7,810  | 26,965  | 17,749 | 1,912      | 6,225    | 244,109   |
| 1978  | 147,859        | 44,823  | 9,834  | 40,979  | 10,038 | 5,621      | 6,873    | 266,027   |
| 1979  | 156,350        | 32,440  | 17,427 | 44,386  | 13,015 | 5,349      | 5,034    | 274,001   |
| 1980* | 104,799        | 8,965   | 10,523 | 51,989  | 13,344 | 5,957      | 1,938    | 197,515   |
| TOTAL | 590,496        | 136,907 | 47,743 | 167,671 | 54,472 | 18,839     | 26,076   | 1,042,204 |

\*not a full year

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Table 6 shows a summary of the distribution of man-hours reported by the IPDCs since their establishment. Seventy-two percent of the time has been attributed to course development, but only 45 percent of the total hours have been directly attributed to the analysis, design, development, and validation of instructional materials. Indirect course development support (made up largely of nonidentified tasks) and nonIPD tasks accounted for approximately 48 percent of the total labor reported during the period 1976 to 1980. In general, the man-hour accounting instruction directs that employees occupying billets which are not IPD dedicated but who work on IPD tasks will assign that portion of their time they are not working on IPD tasks to the nonIPD category.<sup>9</sup> It is not clear whether the time has been appropriately assigned per the instruction. There was some indication that at least a part of the time assigned to the nonIPD category was under the management control of the IPDCs.

TABLE 6. PERCENTAGE DISTRIBUTION BY SELECTED CATEGORIES FOR MAN-HOURS COMMITTED TO THE IPDCs (1976 to 1980)

| <u>Category</u>    | <u>Percent</u> |
|--------------------|----------------|
| Course Development | 72             |
| Direct             | 45             |
| Indirect           | 27             |
| Course Maintenance | 5              |
| NonIPD             | 21             |
| Other              | 2              |
| TOTAL              | 100            |

SAN DIEGO IPDC. An analysis of the labor utilization at the San Diego IPDC from July 1976 to September 1980 is described next. The analysis is limited to the San Diego IPDC since it is the only site which has been in operation long enough to establish any trends. Even this site has relatively few data points from which to estimate trends. Another reason for limiting the analysis to the San Diego site is that a complete set of data showing a detailed functional breakdown of how labor was used is readily available and in a format adaptable for automated data analysis.

The total man-hours expended by the IPDC are shown in table 7. The man-hours shown for 1976 are for less than a full year since the site was not established until July of that year. Similarly, the data for 1980 includes only the first 9 months; i.e., through September 1980. The labor used by the IPDC has increased from 60,552 hours in 1976 to a projected level of 270,000 hours for 1980 and has not changed significantly in the last two years.

<sup>9</sup>CNETSUPPORTINST 7400.1 Code N62 of 27 Jun 1978, subj: Man-hour Accounting for Instructional Program Development (IPD): policy and procedures for.

5 was 308 hours per original course hour.<sup>8</sup> Design and development of the course materials accounted for 34 percent of the time. Indirect labor accounted for 37 percent of the total labor used. Indirect labor includes training and orientation time of new employees, administrative support, leave time, and miscellaneous unidentified tasks. Miscellaneous unidentified tasks accounted for 24 percent of the total labor costs as determined from the detailed man-hour accounting data available. The indirect category does not include typing, audiovisual support, or any other support which could be directly related to each task. The "other" category includes specific tasking of a general nature including, but not limited to, tasks which attempt to develop improved procedures for executing the ISD model.

TABLE 5. MAN-HOURS REQUIRED PER HOUR OF ORIGINAL INSTRUCTION  
FOR SELECTED RATINGS DEVELOPED AT THE NAVY IPDCs\*

| Rating           | Analysis | Design/<br>Development | Other*** | Indirect | Total |
|------------------|----------|------------------------|----------|----------|-------|
| RM               | 19       | 131                    | 65       | 110      | 325   |
| IC               | 93       | 301                    | 98       | 252      | 744   |
| ST               | 63       | 92                     | 42       | 101      | 298   |
| ET               | 32       | 54                     | 22       | 53       | 161   |
| HT               | 24       | 65                     | 13       | 52       | 154   |
| EM**             | 31       | 92                     | 94       | 104      | 321   |
| FA**             | 8        | 113                    | 103      | 106      | 330   |
| EO               | 12       | 44                     | 17       | 38       | 111   |
| DP               | 61       | 85                     | 28       | 89       | 263   |
| SA               | 15       | 275                    | 88       | 194      | 572   |
| AA               | 27       | 247                    | 138      | 351      | 763   |
| Average****      | 40       | 106                    | 47       | 115      | 308   |
| Percent of Total | 13       | 35                     | 15       | 37       | 100   |

\* All instructional material for the above ratings is complete or nearing completion. For those still incomplete, an estimate was made of man-hour requirements. The EM, SA, and AA were significantly increased in length which biases upward the per hour labor estimates.

\*\* Does not include labor services included in contractual support.

\*\*\* Other includes time which was in direct support of the course but not elsewhere classified.

\*\*\*\* Weighted by hours developed for each course.

<sup>8</sup>The average labor requirements for the same set of ratings, when computed using revised hours, were slightly lower at 298 manhours per revised course hour.

TABLE 4. LABOR COSTS INCURRED IN THE DEVELOPMENT OF 12 SELECTED RATINGS

| Rating | Labor Costs (\$1,000) |          | Total    | Equivalent Hours |         | Labor Cost Per Hour |          |
|--------|-----------------------|----------|----------|------------------|---------|---------------------|----------|
|        | Military              | Civilian |          | Original         | Revised | Original            | Revised  |
|        |                       |          |          |                  |         |                     |          |
| RM     | \$ 48.4               | \$ 838.0 | \$ 886.4 | 396              | 396     | \$ 2,238            | \$ 2,238 |
| IC     | 212.3                 | 1,388.8  | 1,601.1  | 284              | 242     | 5,638               | 6,616    |
| ST     | 126.7                 | 536.1    | 662.8    | 300              | 270     | 2,209               | 2,455    |
| ET     | 189.8                 | 560.0    | 749.8    | 772              | 765     | 941                 | 980      |
| HT     | 62.7                  | 258.1    | 320.8    | 311              | 281     | 1,031               | 1,142    |
| EM*    | 19.1                  | 273.3    | 292.4    | 149              | 225     | 1,962               | 1,299    |
| FA*    | 37.2                  | 431.5    | 468.7    | 85               | 140     | 5,076               | 3,348    |
| EO     | 95.7                  | 101.8    | 197.5    | 230              | 230     | 859                 | 859      |
| DP     | 180.8                 | 315.0    | 495.8    | 287              | 258     | 1,728               | 1,922    |
| SA     | 55.3                  | 325.4    | 380.7    | 85               | 140     | 4,479               | 2,719    |
| AA     | 47.2                  | 340.7    | 387.9    | 85               | 140     | 4,564               | 2,771    |
| BE&E   | 0                     | 126.2    | 126.2    | 91               | 90      | 1,387               | 1,402    |

\*Contract supported

and IT). Twelve ratings assigned to the IPDCs were sufficiently complete to estimate development costs. The development costs per revised course hour for these 12 ratings ranged from \$1,461 for the E0 rating to \$12,686 for the IC rating. The average cost per revised course hour was \$4,635. The average cost per original course hour for those 12 ratings was only slightly higher at \$4,970. Appendix A provides a summary of course characteristics for courses completed or nearing completion. Much of the variation in development costs can be attributed to the scope of the tasking and the characteristics of the instructional material being developed. Therefore, the costs experienced for any given course must be judiciously interpreted in conjunction with the tasking and the product. If a new course is significantly different in length from the old course, the development cost per original course hour will be biased in terms of cost per hour of new material developed. Although cost stated in terms of the new course material would be preferable for auditing purposes, the costs in terms of the old course length are more useful for projecting expected development costs. These average development costs appear to be within an acceptable range as determined from previous experience. Furthermore, the average costs were not significantly different whether stated in terms of the old course length or new course length. However, there was considerable variability among the costs for the various ratings.

Labor costs for the 12 ratings are shown in table 4. Labor costs have accounted for 45 percent of all noncontract IPD expenditures. (See table A-6, appendix A.) The most potential for improvement in the productivity rates of the IPDCs will come from the utilization of labor, because other expenditures are largely determined by course characteristics. Since labor costs account for 45 percent of all noncontract expenditures, the potential for improvement in total productivity is somewhat constrained.

#### MANPOWER UTILIZATION

OVERVIEW. The man-hours utilized for revising the instructional material for the ratings which are substantially complete are presented in table 5. The man-hour requirements are based on the number of hours required for development per original course hour.<sup>7</sup> It would conceptually be more appropriate to state the labor utilization rates in terms of the hours of instructional material developed, but those rates would be of little value for planning purposes since the number of hours in the new course are not known until the course is developed. Justification for utilizing present course lengths stems from the fact that present course lengths are reasonably reliable predictors of the newly developed course lengths. Furthermore, it has often been dictated by administrative fiat that the new course must not be longer than the original course and new material has almost always ensured it will be nearly as long.

The labor required per original course hour varied from 111 hours for the E0 rating to 744 hours for the IC rating. The average labor requirement (weighted by hours developed for each course) for the ratings listed in table

<sup>7</sup>Original course hours are determined by the course length in group-paced courses and by average completion time in self-paced courses. The estimates are based on the length of course before development.

TABLE 3. INSTRUCTIONAL MATERIAL DEVELOPMENT COSTS  
PER HOUR FOR SELECTED RATINGS

| Rating   | Total<br>Expenditure<br>\$1,000 | Contract Hours |         | Equivalent<br>Hours Complete |         | Cost Per<br>Equivalent Hours |         |
|----------|---------------------------------|----------------|---------|------------------------------|---------|------------------------------|---------|
|          |                                 | Original       | Revised | Original                     | Revised | Original                     | Revised |
| RM       | \$2,082                         | 396            | 396     | 396                          | 396     | \$5,260                      | \$5,260 |
| DS***    | 357                             | 931            | ID      | ID*                          | ID      | -                            | -       |
| IC       | 3,197                           | 295            | 252     | 284                          | 242     | 11,257                       | 12,686  |
| ST       | 1,111                           | 300            | 270     | 300                          | 270     | 3,703                        | 4,115   |
| ET       | 2,145                           | 848            | 840     | 772                          | 765     | 2,778                        | 2,804   |
| EW       | 7,175                           | **             | ID      | ID                           | ID      | ID                           | ID      |
| HT       | 581                             | 426            | 385     | 311                          | 281     | 1,868                        | 2,068   |
| EM       | 1,523                           | 213**          | 322     | 149                          | 225     | 10,221                       | 6,768   |
| FA       | 1,544                           | 85**           | 140     | 85                           | 140     | 18,165                       | 11,028  |
| EO       | 336                             | 240            | 240     | 230                          | 230     | 1,461                        | 1,461   |
| CH       | 61                              | 355            | 355     | ID                           | ID      | ID                           | ID      |
| UT       | 103                             | 298            | 298     | ID                           | ID      | ID                           | ID      |
| EA       | 35                              | 312            | 312     | ID                           | ID      | ID                           | ID      |
| BU       | 29                              | 251            | 251     | ID                           | ID      | ID                           | ID      |
| SW       | 20                              | 365            | 365     | ID                           | ID      | ID                           | ID      |
| CC       | 5                               | 217            | 217     | ID                           | ID      | ID                           | ID      |
| DP       | 897                             | 312            | 280     | 287                          | 258     | 3,125                        | 3,477   |
| SA       | 831                             | 85             | 140     | 81                           | 134     | 10,259                       | 6,201   |
| AA       | 726                             | 85             | 140     | 81                           | 133     | 8,963                        | 5,459   |
| FT****   | 81                              | 455            | 385     | ID                           | ID      | ID                           | ID      |
| BE&E     | 267                             | New            | 91      | 90                           | 90      | 2,967                        | 2,967   |
| CT       | 2,122                           | **             | **      | ID                           | ID      | ID                           | ID      |
| IT       | 1,186                           | **             | **      | ID                           | ID      | ID                           | ID      |
| RT       | 54                              | -              | -       | ID                           | ID      | ID                           | ID      |
| MM       | 4                               | 190            | -       | ID                           | ID      | ID                           | ID      |
| BT       | 5                               | 240            | -       | ID                           | ID      | ID                           | ID      |
| PE       | 133                             | 125            | -       | ID                           | ID      | ID                           | ID      |
| GM       | 18                              | 252            | -       | ID                           | ID      | ID                           | ID      |
| Existing | 2,965                           | -              | -       | -                            | -       | -                            | -       |
| Other    | 1,533                           | -              | -       | -                            | -       | -                            | -       |
| Total    | \$31,156                        | 7,276          | -       | 3,066                        | -       | 4,970                        | 4,635   |
| Average  | -                               | -              | -       | -                            | -       | -                            | -       |

\* ID = Insufficient Data  
\*\*Contract Supported\*\*\* Analysis Only  
\*\*\*\*Phase I Only

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TABLE 2. RELATIONSHIP OF COURSES AND CONTACT HOURS TO THE PERCENT OF TOTAL TRAINING DAYS FOR ALL NAVEDTRACOM COURSES\*

| <u>Cumulative<br/>Number of<br/>Courses</u> | <u>Cumulative<br/>Training Days<br/>(1,000)</u> | <u>Percent of Total<br/>Training Days</u> | <u>Cumulative<br/>Contact Hrs</u> | <u>Percent of<br/>Total Hrs</u> |
|---|---|---|-----------------------------------|---------------------------------|
| 7   | 820   | 5   | 227                               | 0.04                            |
| 15  | 1,640   | 10  | 622                               | 0.11                            |
| 24  | 2,461   | 15  | 1,630                             | 0.30                            |
| 28  | 3,281   | 20  | 1,842                             | 0.34                            |
| 34  | 4,101   | 25  | 2,613                             | 0.48                            |
| 48  | 4,921   | 30  | 4,420                             | 0.82                            |
| 62  | 5,742   | 35  | 6,478                             | 1.20                            |
| 90  | 6,562   | 40  | 9,662                             | 1.79                            |
| 110   | 7,382   | 45  | 12,846                            | 2.38                            |
| 129   | 8,202   | 50  | 17,490                            | 3.25                            |
| 151   | 9,023   | 55  | 21,500                            | 3.99                            |
| 181   | 9,843   | 60  | 26,508                            | 4.92                            |
| 231   | 10,663  | 65  | 35,001                            | 6.49                            |
| 310   | 11,483  | 70  | 47,899                            | 8.89                            |
| 417   | 12,303  | 75  | 63,952                            | 11.87                           |
| 572   | 13,124  | 80  | 86,183                            | 15.99                           |
| 826   | 13,944  | 85  | 125,124                           | 23.22                           |
| 1,145                                       | 14,764  | 90  | 180,101                           | 33.42                           |
| 1,663                                       | 15,584  | 95  | 279,005                           | 51.77                           |
| 2,869                                       | 16,405  | 100                                       | 538,932                           | 100.00                          |

\* Excludes Basic Military Training



When past IPDC performance is compared to the task of applying the ISD process to the 539,000 contact hours in the 2,900 courses reported in NITRAS, the impossibility of accomplishing this task using a few highly centralized IPDCs is apparent. Though this limitation of the IPDCs capacity was recognized in the IPDC planning, the mechanics and resources for applying ISD to all Navy courses are still not available.

A summary of these courses, contact hours, and training days as computed from NITRAS data is contained in table 2. The courses have been ranked by throughput and the data cumulated for each 5 percent increment in total training days. For example, the first 129 courses represent approximately 8.2 million training days or 50 percent of the total training days and approximately 17.5 thousand contact hours or 3.25 percent of the total contact hours. (The distribution of training days and contact hours for the "A," "C," and "F" courses is shown in tables A-2, A-3, and A-4, respectively (See appendix A.))

Table 2 shows that a relatively large share of the total Navy training is represented by a relatively small share of the total contact hours. The IPD effort could be applied to 75 percent of total Navy training by developing only 12 percent of the total contact hours or 63,900 course contact hours. All of the courses making up the above 12 percent will not need major revision and by carefully selecting the courses for development a substantial part of Naval training can be developed without completely developing all courses. The most return for resources utilized at the IPDCs will be realized if those courses scheduled for development in the IPDCs are those courses which have a relatively high throughput and are the most deficient in meeting the current training objectives.

#### IPD EXPENDITURES

From the establishment of the IPDCs in 1976 through September 1980, the total IPD expenditures have exceeded \$31 million (table 3). These represent the actual budgeted expenditures and are considerably less than the actual taxpayer costs of the program. Much of the overhead costs are not included in these cost data. A total of \$7.2 million, or 23 percent of the total IPD resources, was expended on software development (and some minor equipment purchases) supporting the EW rating. Approximately \$2.2 million was committed for a software development contract to support EW. Much of the output of this software contract was of minimal value because the contract for hardware (for which the software was being developed) was terminated. Detailed expenditure and other summary data for each rating are shown in table A-5 (appendix A).

Nearly \$3 million was apparently devoted to supporting existing school programs and was not used in direct support for developing the instructional material for courses assigned to the IPDCs for development. The ratings listed in table 3 are listed by dates in which they were first tasked by CNET. There is no evidence from these data to indicate that productivity rates have been improving. However, variation in tasking, contract services, and the extent of the development effort would tend to obscure trends which might indicate changes in productivity rates.

The original 7,200 course contact hours scheduled for ISD at the IPDCs do not include those ratings which have been heavily contract supported (EW, CT,

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TABLE 1. COMPLETION STATUS FOR COURSES/RATINGS UNDER DEVELOPMENT AT THE IPDCS AS OF SEPTEMBER 1980

| Rating | Percent Complete |        |             |            |
|--------|------------------|--------|-------------|------------|
|        | Analysis         | Design | Development | Validation |
| RM     | 100              | 100    | 100         | 100        |
| DS     | 100              | N/A    | N/A         | N/A        |
| IC     | 100              | 95     | 95          | 95         |
| ST     | 100              | 0-99   | 0-99        | 0-99       |
| ET     | 100              | 85     | 85          | 85         |
| HT     | 100              | 63     | 63          | 63         |
| EM     | 100              | 60     | 60          | 0          |
| FA     | N/A              | 100    | 100         | 75         |
| EO     | 100              | 95     | 95          | 95         |
| CM     | 100              | 0      | 0           | 0          |
| UT     | 100              | 46     | 46          | 46         |
| EA     | 100              | 0      | 0           | 0          |
| BU     | 100              | 0      | 0           | 0          |
| SW     | 100              | 0      | 0           | 0          |
| CE     | 100              | 0      | 0           | 0          |
| DP     | 100              | 87     | 87          | 87         |
| SA     | N/A              | 96     | 96          | 96         |
| AA     | N/A              | 100    | 100         | 85         |
| FT     | 60               | 10     | 10          | 0          |
| BE&E   | N/A              | 90     | 90          | 10         |
| EW     | *                | *      | *           | *          |
| CT     | *                | *      | *           | *          |
| IT     | *                | *      | *           | *          |
| RT     | 30               | N/A    | N/A         | N/A        |
| MM     | 35               | 8      | 8           | 0          |
| BT     | 35               | 8      | 8           | 0          |
| PE     | 75               | 30     | 30          | 0          |
| GM     | N/A              | 5      | 5           | 0          |

\* Contract supported

## SECTION II

### ANALYSIS

This section includes:

- . an analysis of cost and productivity for developmental work completed and currently underway at the IPDCs
- . a summary of the IPDC expenditures for the 1976 to 1980 period
- . an analysis of the expenditure and output data to determine productivity and trends in development cost
- . an analysis of the utilization of manpower.

#### COURSES/RATINGS CURRENTLY UNDER DEVELOPMENT

The first tasking from CNET to the IPDCs was issued in May 1976. Since then, taskings have been issued to develop and revise courses and/or modules which support nearly 30 ratings. The taskings have varied from those requiring complete revision of an entire curriculum (e.g., RM rating) to others which focused on the development of instructional material for specific equipments (e.g., the ST rating).

Table 1 lists the ratings for which instructional material development has been completed or is underway. The RM rating is the only rating reported 100 percent complete as of September 1980. Several ratings are nearing completion, and the revised curricula for a number of these have been tested and are being implemented. Considerable difficulty has been encountered with the RM and IC curricula and consequently there have been a number of special taskings to correct deficiencies. Much of the difficulty stems from the fact that these were the first ratings developed. The resources required for these corrective taskings have been attributed to course maintenance and included in the course maintenance data in the resource accounting. A number of ratings listed in table 1 include recent taskings and only minimal work has been accomplished to date on these taskings.

The courses supporting the 28 ratings listed in table 1 which have been scheduled for treatment by the IPDCs represent approximately 7,200 original contact hours as determined from data in the Navy Integrated Training Resources and Administrative System (NITRAS). These courses, when completed, will include less than 2 percent of the total contact hours and 17 percent of the total training days. However, many of the courses included represent recent taskings, and the work underway does not accurately reflect or measure the accomplishment over the first four years of the ISD/IPDC commitment. If only those ratings are included in which the validation phase is reported at least 85 percent complete as of September 1980, then approximately 0.5 percent of all contact hours have been revised which includes less than 4 percent of the total training days. Tasking to date has almost totally involved the "A" courses. Those courses which are substantially complete account for approximately 4 percent of all "A" school contact hours and include approximately 12 percent of the total "A" school training.

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which were submitted at least bi-weekly between the period 1976 and 1980, were also reviewed to isolate those problems which were reported and assumed to impact on the operation of the IPDCs.

Each IPD site reports a detailed breakdown of labor utilization in a CNET developed and maintained man-hour accounting system. These data were collected, summarized, and analyzed to extract information on the utilization of labor.

The expenditures attributed to the IPD effort have been carefully documented since the establishment of the first IPDC at San Diego in July 1976. These expenditures are documented in sufficient detail to identify the resources expended by each tasking and/or course. These detailed cost data were collected for the period July 1976 to September 1980 and are the basis of the cost analysis presented in this study. The cost data compiled for each tasking and course were reconciled with the official budgetary records to insure data integrity.

Each month the situation summaries for each IPDC provide an estimate of the percent complete of each tasking. These estimates were used to determine the equivalent hours. The equivalent hours were then used as a basis for determining the cost of work in progress. Each IPDC was asked to complete a form explaining the characteristics of the courses which have been developed. A summary of the survey results is presented in appendix A. Productivity rates were computed on the basis of equivalent hours completed using data obtained from the above sources.

The man-hour accounting data and cost summaries presented in this report are often drawn from different sources. These aggregate summaries were used to extract information which would enable judgments to be made about current productivity rates and trends, and to relate the potential work effort ahead to what has been accomplished over the first four years of the IPDCs' efforts.

The need to draw data from various sources has led to some reduction in precision of numbers but not in the objective of obtaining useful management information for planning. This study drew extensively from existing data bases and interim status reports and any deficiencies in these data bases and reports will, to some extent, be reflected in the study findings. An effort was made to identify these deficiencies, and the findings were then appropriately caveated.

### ORGANIZATION OF THE REPORT

In addition to this introduction, the report contains three sections and two appendices. Section II contains an analysis of the cost and utilization of manpower for the period 1976 to 1980. The analysis focuses on the two major IPDCs at San Diego and Great Lakes and includes a detailed descriptive analysis of manpower utilization trends at the San Diego IPDC. Section III addresses problems dealing with productivity and output of the IPDCs. Section IV contains a summary of the report including resources expended, problems, and recommendations. Appendix A is a summary of cost and productivity data. Appendix B includes detailed labor utilization by ISD functions and pay periods for a selected set of courses which have been developed.

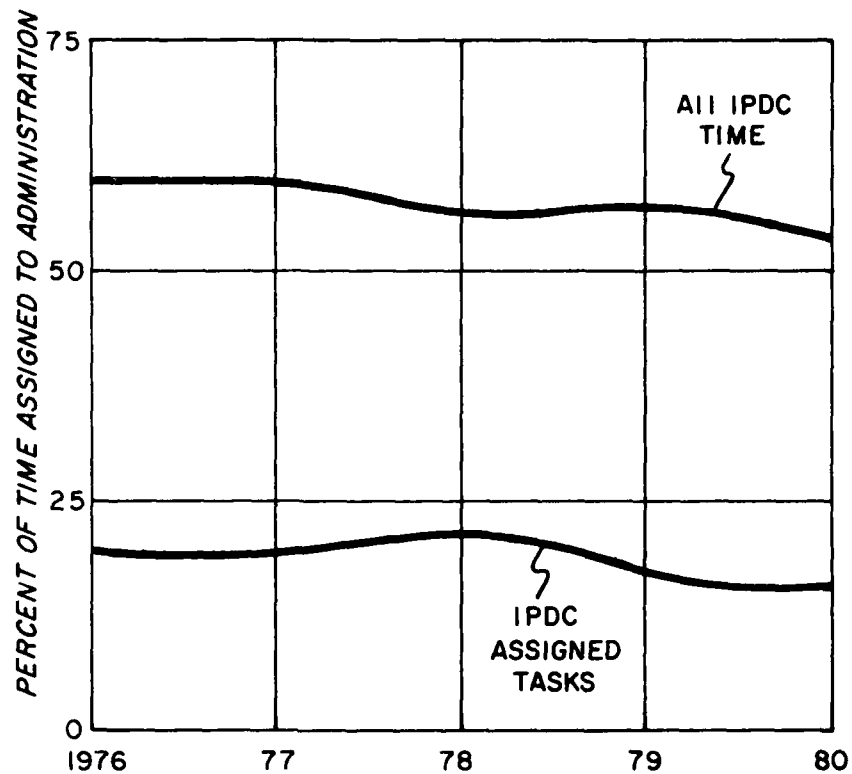


Figure 1. Percent of IPDC Time Assigned to Administration, 1976 to 1980 (San Diego)



Figure 2. Percent of Total Time Available Which Was Allocated to NonIPD and Nonidentified Tasks (1976 to 1980)

TABLE 10. MANPOWER UTILIZATION AS DISTRIBUTED BETWEEN  
ASSIGNED TASKS AND OTHER FUNCTIONS, SAN DIEGO (1976 to 1980)

| Category        | 1976   |         |  | 1977    |         |  | 1978    |         |  | 1979    |         |  | 1980    |         |  |
|-----------------|--------|---------|--|---------|---------|--|---------|---------|--|---------|---------|--|---------|---------|--|
|                 | Hours  | Percent |  | Hours   | Percent |  | Hours   | Percent |  | Hours   | Percent |  | Hours   | Percent |  |
| Non-IPD/No Task | 30,779 | 50      |  | 87,154  | 36      |  | 110,749 | 41      |  | 101,135 | 37      |  | 67,520  | 34      |  |
| Leave           | 7,200  | 12      |  | 29,300  | 12      |  | 31,900  | 12      |  | 35,646  | 13      |  | 22,447  | 11      |  |
| Assigned Tasks  | 22,573 | 38      |  | 127,655 | 52      |  | 123,398 | 46      |  | 137,220 | 50      |  | 107,548 | 55      |  |
| TOTAL           | 60,552 | 100     |  | 244,109 | 100     |  | 266,027 | 100     |  | 274,001 | 100     |  | 197,515 | 100     |  |

**LEGEND:**

Blank = No time assigned  
- = Less than 1 man-period  
1 to 9 = 1 to 9 man-periods  
\* = 10 man-periods

A = 11-19 man-periods  
B = 20-29 man-periods  
C = 30-39 man-periods  
D = 40-49 man-periods  
E = 50-59 man-periods  
F = 60-69 man-periods  
G = 70-79 man-periods  
H = 80-89 man-periods  
I = 90-99 man-periods

Figure 3. Distribution of Man-periods Among Ratings Which Were Assigned for Development at the San Diego IPDC (1976 to 1980) (Man-period = one pay period or 80 man-hours.)

### SECTION III

#### IPDC PRODUCTIVITY

The rate at which the IPDCs develop instructional materials can be increased by committing more resources to the IPDC and improving the efficiency of the developmental process.

#### RESOURCES COMMITTED TO THE IPDCs

The Navy must develop instructional material to train personnel in the use and maintenance of new technology and to update and improve existing courses. The essential question is whether the highly structured IPDC is the most efficient way to accomplish the necessary course development and/or revision.

Past justification for the IPDCs has rested on the assumption that an IPDC developed course would be of high quality and would usually reduce training time. It was assumed that expenditures to establish and operate the IPDC would be justified by the cost savings associated with the reduced training time. Therefore, there was little effort, if any, devoted to analyses of alternative strategies for implementing the ISD model. However, as shown in section II, the current rate of course development by the IPDCs will not be adequate to develop, update, and maintain all Navy courses in a timely manner.

Since the rate at which development occurs in the IPDCs depends primarily on the quantity of resources devoted to the ISD effort, it will require a massive investment and expenditure to apply the ISD process to all courses using the present highly structured IPDC organization. Even if the average development time at the IPDCs could be reduced to 100 man-hours per hour of instruction (a 100 percent improvement) with over 500,000 hours of instruction in all NAVEDTRACOM courses, it would require a minimum of six to seven thousand man-years to develop all courses. The labor required for course maintenance would add significantly to manning required.

The benefits of past IPD efforts, in terms of quality and relevancy of instruction and reduction of training time, may well exceed the costs even though it will require a large commitment of resources to completely ISD all Navy courses. For example, although most IPDC personnel would prefer to eliminate the IC rating (because of the high development costs) from any analysis which attempts to determine the returns to the ISD process, the data indicate that the IC course will be reduced by more than 20 percent in length. Assuming no degradation in student performance from using the new course, the reduction in course length will yield substantial benefits in terms of resources saved making it a highly attractive investment. The reduction in student costs would pay for the development costs in four to five years.

Even so, a favorable benefit/cost ratio does not justify the present structure of the IPDCs if the benefits per dollar of expenditure may be further increased by alternative means. For example, restructuring the IPDCs in a way which more fully integrates the local school resources into



the development process may reduce development costs. In addition, benefits could be improved by limiting the IPDC efforts to those courses which have high throughput and to those courses or parts of courses which are determined to be deficient in effectiveness and/or efficiency.

Resources committed to the ISD effort at the IPDC can yield significant returns, but the amount which should be allocated to ISD depends upon the alternative returns from other competing resource demands. Analyses to support those allocation decisions are beyond the scope of this effort. However, once the decision is made to allocate a specified level of funding to the IPD effort then an appropriate management objective is to utilize those funds to maximize the benefits to the training command. This report is intended to support the latter management objective.

#### MEASURING EFFICIENCY IN THE DEVELOPMENT OF COURSES

Efficiency in production is measured as the rate of output per unit of resources employed. Identification, measurement, and the tracking of resources utilized have been relatively complete and accurate for the Navy IPD effort. However, the identification and measurement of the IPDCs' output is at best a highly subjective undertaking. One measure of efficiency in production frequently employed is the resources used per original course hour revised and/or developed. Much of the criticism of this measure centers on the fact that the scope of the effort among the various tasks was quite different. Consequently, variation in resources utilized (per original course hour) among the various courses would arise from factors other than variation in efficiency. However, the present course length (or average contact hours), an indirect measure, is the only readily available measure for estimating the magnitude of work required for any course scheduled for ISD. Productivity rates derived from these measures provide useful data for management and planning.

The cost and man-hour requirements per original contact hour were computed for courses presently under development at the IPDC. Because of the variation in tasking, course characteristics, quality of existing course material, and a number of other factors, the productivity rates experienced in the development of each course must be heavily caveated in their interpretation. A particular productivity rate only offers evidence of the general magnitude of effort which will be required for future ISD/IPD work, and the resources used for the development of any given rating should not be the sole basis for making judgments about the efficiency of IPDCs in developing that rating.

The development cost per original contact hour which has been computed for the IPDCs efforts to date may, in some instances, tend to understate the costs which would have been experienced with a full developmental effort. This potential underestimate would result from two considerations. First, the costs are averaged over all of the original contact hours and if a significant amount of material from the existing course was adequate or needed only minimal development it would tend to reduce the average cost per original hour. Second, if the IPDC only addressed certain phases of the ISD model then average cost per original contact hour would be underestimated.

The man-hour and cost accounting data provide a record of the utilization of resources committed to the IPD effort since the establishment of the IPDCs. However, no clear and standardized means for identifying the nature and scope of

the tasking of the IPDCs by CNET exists. Tasking letters from CNET to the IPDCs vary from very cryptic, generalized statements to more specific statements detailing the nature of the work to be accomplished. The establishment of a preanalysis baseline data report at the initiation of each task would provide the basis for ascertaining the nature and scope of the development effort. The resources required, present length of course, throughput, student performance scores, average on board and a number of other data items could be included in this baseline report. At the present time many of these data are not readily available and it is difficult to reconstruct the data to use as a basis for evaluating the present IPD effort.

When a tasking is completed, a postdevelopment report could be prepared which would include data on the new course. Many of the data items would be identical to the preanalysis report. Using these data items, one could determine how the course was changed and what resources were committed to effect those changes. One significant difficulty with the present reporting system is that there seems to be no point in the development process where a course can be identified as completed. Each course developed seems to have transitioned into a maintenance mode with no clear demarcation between development and maintenance. Consequently, data on the length of the new course, instructional methods utilized, and other course characteristics remain ambiguous. The values placed on each data element depend to a large extent on when the data are collected. This ambiguity compounds the problem of attempting to determine if the ISD process resulted in a product worth the expenditure. A CNET instruction establishing a pre and postdevelopment report could eliminate a great deal of the problems encountered in analyzing the benefits and costs resulting from the application of the ISD process.

The major deficiency in attempting to evaluate the efficiency of the entire ISD/IPD effort stems from the lack of any baseline data from which one can determine whether students trained using the new course are able to perform at a higher proficiency level and receive more relevant training than those trained using the old course. Tests are developed in the early stages of the ISD process which reflect current training needs and requirements. These tests could be administered to a sample of students trained using the old curriculum and then later to a sample of students using the new curriculum. Differences could be attributed to the change in curriculum resulting from the IPD effort.

Students trained using the old curriculum may not perform well when measured against a new and updated set of training objectives. For this reason this approach has been criticized as an unfair basis for making a judgment as to the adequacy of training received in the existing schools. Such criticism is based on the unwarranted assumption that it is only the present schools performance which is being judged. The appropriate objective is to determine if the students being trained using the present curriculum are able to perform according to present needs. If the students are performing according to present needs then the curriculum should not be targeted as a high priority course for continued instructional systems development. If they are not performing, then for whatever reason, the curriculum and/or school management needs to be revised and updated. Performance measures obtained from such testing would provide a quantitative and objective basis for judging the effectiveness of any subsequent development.

These performance data could then be used for making judgments as to the relative effectiveness of the newly developed course and for making inferences about the desirability of the current ISD/IPDC approach to curriculum development. Effectiveness of the course is defined here to mean the degree to which the students trained using the new course are able to perform as measured against a current and updated set of training objectives. Since the resources will have already been committed to the development, any possible deterioration or improvement in performance using the new course would serve only for guiding and planning future development. Such performance data are necessary for making long-run decisions about the economic feasibility of the entire ISD/IPDC approach to curriculum development.

#### PRODUCTIVITY ENHANCEMENT

The large number of courses which require revision, the resource constraints, and the rate of development which the Navy has experienced with the present IPDCs make it apparent that some modification in the way the ISD model has been implemented is necessary, if most of those courses needing attention are to be treated in a reasonable length of time. A move away from a philosophical approach of doing development "for the schools" to one in which development is done "with the schools" would substantially resolve many problems presently encountered. When the course development function was removed from the school and placed in the IPDCs, the opportunity for utilizing any schoolhouse resources for course development was greatly diminished.

An IPD/ISD program which is highly integrated with the school would help to minimize the political difficulties encountered when it becomes necessary to update and develop a course. In addition, resources could be used more efficiently if considerably more effort were devoted to a preanalysis of the existing course. Such an analysis would make explicit any unique problems associated with the course/school. It would also aid in isolating those parts of the course which were in need of development and revision as well as isolating those parts which were adequate.

The greatest benefits from resources applied to ISD can be realized if those resources are applied to courses and modules of courses which have the highest throughput and which are in the worst condition as determined from deficiencies in student performance. Those courses for which student performance is adequate should not be high on the priority list for ISD even though the course material may not meet all criteria of the ISD model.

There was an underlying perception among personnel in the centers that the ISD procedures may be too restrictive and the IPDCs need more latitude to alter the procedures to fit the task. Although difficult to identify explicit incidents, there seems to be a predominant orientation toward the process rather than the product. The "block phenomena" permeates almost every discussion about ISD. This "block" orientation aids in understanding the ISD process but appears to be detrimental and restrictive in applying and implementing the process. The objective of the IPD effort should be to produce quality instructional material and not just to follow the ISD model for its own sake. Application of the ISD model should be viewed as a means to an end and not as an end in itself. In the final analysis, the development of quality curricula is as much an art as a science and the ability to recognize and take acceptable shortcuts

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in the application of the ISD process should come with experience. However, with the rapid turnover of personnel, the potential for gaining that corporate experience is severely constrained.

The purpose and use of the ISD model seems to have been placed in perspective for Army schools by a recent communication issued by the Army Training and Doctrine Command (TRADOC). This message states that the interservice procedure for Instructional Systems Development "... is to be used as a guide only. It is not a regulation. Its purpose is to provide to the service schools a general model, one of a number of such models, which describe a set of procedures for the systematic development, implementation, and evaluation of training and training products."<sup>10</sup>

If the primary function of the IPDC is to develop instructional material using the ISD process, and if the performance of the center is to be measured in terms of the rate at which instructional material is developed and/or revised and the quality of that material, then the percentage of time devoted to nonIPD and nonidentified tasks must be reduced. The administrative time devoted to direct support of the courses does not seem unreasonable (approximately 20 percent), but the time assigned to the nonIPD and nonidentified tasks is significantly reducing the time available for developing instructional material.

<sup>10</sup>TRADOC msg 101000Z Oct 80, subj: Instructional Systems Development (ISD) Procedures.

SECTION IV

SUMMARY OF FINDINGS

The IPDCs were established in 1976 and since their establishment \$31 million, identified as IPD funds, has been expended. A total of \$7.2 million, or 23 percent of total expenditures, has been in support of the EW rating. (This study does not include a detailed analysis of the ISD effort associated with EW courses since the organization of the EW effort is atypical of the way the IPDCs have operated during the first four years.)

During the period 1976 through September 1980, the development for one rating has been reported to be 100 percent complete. However, the instructional material for at least 12 courses and/or ratings is essentially complete and has been either placed in the school or is in the process of being validated and is nearly ready for implementation.

Excluding those courses which are being developed under contract, the IPDCs, as of September 1980, have scheduled approximately 8,000 original contact hours for development. Most of this development was type "A" courses. The 8,000 hours represent less than 2 percent of the total contact hours which presently exist in the CNET controlled courses and approximately 10 percent of the total of type "A" courses. Because a number of the ratings developed included high throughput courses, the proportion of the total Navy training which will use this new material is considerably higher than the above percentages would imply. Including work in progress (for those ratings which were sufficiently complete to make estimates), it was estimated that 3,200 equivalent hours of original course material has been revised and/or developed. These nearly completed courses represent approximately 0.5 percent of all contact hours and approximately 4 percent of type "A" contact hours. Generally, these were high throughput courses and ones in need of attention. The benefits are somewhat greater than the latter percentages would imply.

During this period, \$21 million (excluding contracted courses) was expended in support of the IPDCs of which an estimated \$3 million was devoted to supporting existing school programs and not used in direct support for developing the instructional material for courses/ratings assigned to the IPDCs. The average cost of revising the original material for the efforts which were completed or nearing completion was \$4,970 per original hour. The average man-hour requirement to date has been 308 man-hours per original course hour (varying from a low of 111 to a high of 744). The IPDCs did not do all phases of the ISD process for all courses assigned for development. Consequently, the man-hours may tend to be slightly understated when interpreted in terms of labor requirements for a full ISD effort. The distribution of labor among the phases of the ISD process for the ratings nearing completion was as follows: analysis, 13 percent; design and development, 35 percent; other, 15 percent; and indirect support, 37 percent. The other category includes administrative overhead support which could be directly attributed to the course under development.

Excluding the RM and IC ratings, since they were the first ratings developed, there is no evidence to indicate that the rate of productivity has shown any consistent improvement. The resources utilized per hour of material developed/

revised does not appear to be decreasing; on that basis alone one might infer that there has been no improvement in productivity. However, the quality of the instructional material and, ultimately, student performance is as important to productivity measurement as the rate of resource utilization. The paucity of data reflecting changes in instructional material quality and student performance resulting from the ISD process makes judgments about productivity highly tenuous. Sufficient data are not available to reach any definite conclusions about the changes in productivity, aside from the fact that a great deal of disagreement exists on just how one should measure the productivity of the centers.

The one metric available to place in perspective the potential magnitude of developmental work to be done is the number of existing contact hours presently under the cognizance of NAVEDTRACOM. Using original contact hours as a basis of judgment, and considering (1) the rate at which development is being accomplished, (2) the cost of developing, and (3) the amount accomplished to date, one must conclude that the present highly structured IPDCs simply do not provide a realistic capability for developing and maintaining all "A," "C," and "F" CNET-controlled courses.

One basis on which the highly structured ISD/IPDC program was justified was that it would reduce the training time in the courses while at least maintaining the same level of training effectiveness. Since so few courses have been completely developed, it is difficult to determine if the average projected reduction in course length of 10 to 15 percent is going to be realized in the long run. An estimate of the final course lengths for courses presently under revision would indicate that the reduction in hours will be approximately 10 percent. However, these estimates are so tenuous and experience so limited that no reliable conclusions can be made from the experience with the courses presently being developed at the IPDCs.

The assumption that training effectiveness will at least be maintained can be neither objectively supported nor rejected. There simply is no objective data base being developed and maintained from which to make decisions about the relative effectiveness of the newly developed course versus the old course. There is an implicit assumption that any course which has been developed using the ISD process will result in more effective and relevant training. However, except for a few isolated efforts, there is no widespread effort to pre and posttest the students' performance using current and updated training objectives to establish the validity of this assumption.

There is some potential for improving the rate at which curriculum can be developed by more rigid controls on the utilization of manpower at the IPDCs. This would essentially require the IPDCs to commit their manpower only to the IPD assigned tasks. Such constraints on assignment would address the problem of utilization but not the problem of efficiency. It is unclear as to the nature of the unidentified and nonIPD tasks. To the extent that such tasks do in fact play a vital support role to the IPDC, then the potential for improvement in the rate of production would be diminished.

#### PROBLEM AREAS

Monthly situation summaries have been submitted to CNET by each of the IPDCs since the centers were established. These summaries document problem

areas encountered by the centers. The problems presented in the situation summaries are summarized in table 11. By far, the most difficult problem encountered since the establishment of the IPDCs has been the availability of subject-matter expert (SME) support although there has been a significant decline in the number of incidents reported. There was, however, indications from interviews with IPDC personnel that SME availability continues to be a severe problem and the decline in incidents reported stems from the fact that the reporting of the SME difficulties did not stimulate any relief from the problem. The futility of reporting led to a reduction in the number of incidents reported. Most problems have shown a significant decline in incidents reported since 1977, except personnel acquisition and retention. The acquisition and retention of skilled personnel have been rather severe problems since the establishment of the IPDCs. The largest IPDC, San Diego, has experienced a great deal of personnel turnover at the midmanagement level. A review of personnel actions, as reported in the situation summaries, indicated that 70 individuals were hired at the GS-9 to GS-13 level during July 1976 to September 1980. During that period there were 51 resignations in that same group. The average tenure for those resigning (as computed using those individuals for which a hiring and resignation date were available) was approximately 20 months. The total civilian strength during this period (including all GS grades) varied within an approximate range of 85 to 95 individuals. Many individuals who left the organization were highly skilled technologists, and turnover of those personnel adversely affected the productivity of the center. The high turnover was attributed in a large measure to (1) the fact that higher paying jobs were available to those individuals once they became experienced in the ISD process and (2) the high cost of living in the San Diego area.

The following represents a synthesis of the problem areas identified during interviews with personnel ranging from the commanding officer to working personnel at the IPDCs.

- . There was a great deal of criticism of the lack of well defined interfaces among CNET, CNTECHTRA, the schools, and the IPDCs. The role of the CNET IPD management does not appear to be clearly perceived at the IPDCs. Difficulties which occur between the IPDCs and schools when the ISD process is undertaken are often perceived as a result of insufficient ground work at the higher command.
- . Interfaces which develop among the participants in the ISD process are too often of an adversary relationship. This tends to reduce significantly the efficiency and effectiveness of the IPDC team in its major function as a curriculum developer. More explicit policy defining the interfaces, responsibility, and accountability, and strict enforcement of that policy, would tend to reduce the ambiguity facing the IPDCs.
- . The IPDCs personnel have expressed considerable concern about the number and frequency of nonIPD related tasks and peripheral duties assigned to the centers. This concern is substantiated by the inordinate amount of time allocated to nonIPD and overhead functions in the manpower accounting data.

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TABLE 11. NUMBER OF INCIDENTS REPORTED FOR SELECTED  
PROBLEM AREAS (1977 to 1980)

| Problem Area                         | 1977 | 1978 | 1979 | 1980* |
|--------------------------------------|------|------|------|-------|
| Inadequate SME Support               | 24   | 51   | 11   | 2     |
| Acquisition of Course Equipment      |      | 8    | 11   | 6     |
| Validation                           | 10   | 11   | 7    | 6     |
| Command Communication Problems       | 20   | 13   | 8    | 4     |
| Personnel Acquisition, Retention     | 6    | 13   | 3    | 13    |
| Task Modifications and Revisions     | 7    | 5    | 2    | 0     |
| IPDC Support: Facilities & Equipment | 4    | 6    | 1    | 0     |
| TOTAL                                | 71   | 107  | 43   | 31    |

\* For 9 months



The future productivity of the IPDCs will be diminished significantly if course maintenance is retained as an IPDC responsibility. An insufficient number of courses have been completed to make any quantitative judgments about the future requirements for maintenance. Estimates indicate that maintenance may take, on a permanent annual basis, 15 to 20 percent of the total resources used in the development of a course. Thus, it becomes readily apparent that future productivity of the IPDCs will quickly decline as they become encumbered with maintenance tasks; their ability to undertake new development will be severely limited and ultimately virtually eliminated.

The compatibility of the POM and budget cycle with the requirements of the IPDCs was severely criticized. The POM cycle forces the requirements for training equipment and aids to be identified and funding requests to be submitted long before the developers have established the type of equipment needed. This tends to bias the criteria for selection of instructional methods. It also sets unnecessary and unwarranted constraints on the options available to the curriculum developer and has contributed to untimely deliveries of training equipment. A more appropriate means for maintaining the necessary flexibility in the selection of instructional methods by the developer would be to provide program or block funding to the IPDCs for acquisition of training aids and equipment. Such funding would provide managers and developers the flexibility to direct resources to those courses where the need is determined as the design and development of the course(s) unfolds.

The IPDC personnel were concerned with the ability of the military personnel assigned to the center to contribute to the ISD process. Much of this concern arose from the fact that the military personnel selected for assignment to the IPDCs were often relatively inexperienced in their ratings and often below the rank authorized.

The perceived inability of the military personnel to contribute significantly to the ISD process could be attributed, in part, to their lack of experience and also in part to the lack of an effective ISD training program for newly assigned military personnel. There was also some indication that a few military SMEs were frequently detailed to the IPDCs during periods when they would have normally been off duty. Such personnel management does not contribute to a highly motivated individual.

The military personnel are intended to contribute most to the analysis phase, especially the task analysis effort which provides the basis for the training objectives. If the analysis effort is reduced at the IPDCs, as initiatives currently underway would indicate, then the need for military personnel assigned to the IPDCs, would be further reduced unless utilization patterns in those personnel are changed. Evidence indicates that there is a change underway in how the military are being utilized. For example, at the San Diego site approximately one-third of the military time is now assigned to development functions, and this has shown a steady increase since 1976. In 1980 less than 10 percent of the military time was assigned to analysis. (See table B-8, appendix B.)

## RECOMMENDATIONS

Actions which should be considered for improving productivity rates and management of the centers are outlined below.

- . Policies and programs should be developed which will insure the maintenance of a more stable work force at the IPDCs.
- . A more thorough preanalysis of existing course material should be done for each course selected for development with the objective of selecting and targeting for development only those parts of the course which are deficient.
- . Policy statements should be developed which make explicit the approval requirements, school interfaces, and division of responsibilities between the IPDCs and CNET management.
- . Procedures should be developed for determining and measuring the changes in training relevance and effectiveness which any ISD effort has effected. A pre and postISD testing of students, using a test reflecting current training objectives, would aid in isolating those parts or modules of courses which are deficient. Equally important, the results would provide an objective basis for assessing, for planning purposes, whether student performance was sufficiently improved to warrant the IPD expenditure.
- . Improvements should be made in the current resource tracking system with the objective of simplifying and providing more relevant management information.
- . A standardized CNET course/curriculum status report should be submitted prior to the start of an ISD task and a similar final report should be submitted at the conclusion of each tasking. These reports would document the resources expended, curriculum materials developed, pre and posttest results, course characteristics, results of the pilot testing and other relevant data.
- . An organizational structure should be developed which is sufficiently flexible to provide technical support to any ISD team made up of IPDC personnel, school personnel or any combination of both. The structure of the team would depend on resources available at both the IPDC and school, potential payoff from the course development, and criticality of the course.
- . Block or program funding should be provided for the acquisition of training equipment and materials required to support the courses developed/revised at the IPDCs.

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| ST | 2 WEEK PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      | MAN-HOURS BY FUNCTION |      |       |      |      |      |      |      |      |
|----|---------------|-----------------------|------|------|------|------|-----------------------|------|-------|------|------|------|------|------|------|
|    |               | ADMIN                 | ANAL | DSGN | DEVL | MDTA | EVAL                  | TRNG | ADMIN | ANAL | DSGN | DEVL | MDTA | EVAL | TRNG |
| 12 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 13 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 14 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 15 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 16 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 17 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 18 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 19 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 20 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 21 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 22 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 23 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 24 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 25 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 26 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 27 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 28 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 29 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 30 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 31 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 32 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 33 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 34 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 35 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 36 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 37 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 38 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 39 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 40 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 41 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 42 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 43 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 44 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 45 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 46 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 47 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 48 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 49 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 50 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 51 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 52 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 53 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 54 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 55 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 56 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 57 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
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| 60 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
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| 65 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 66 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 67 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 68 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 69 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |
| 70 |               |                       |      |      |      |      |                       |      |       |      |      |      |      |      |      |

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TABLE D-2. DISTRIBUTION OF PERSONS IN THE PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE IC RATING (continued)

| PERIOD | ADMA  | ANAL  | DSGN  | DVLP  | MDIA  | EVAL | TRNG | TOTAL  | ADMA | ANAL | DSGN | DVLP | MDIA | EVAL | TRNG |
|--------|-------|-------|-------|-------|-------|------|------|--------|------|------|------|------|------|------|------|
| 71     | 632   | 9     | 98    | 1402  | 210   | 29   | 3    | 2383   | 26   | 0    | 4    | 58   | 6    | 1    | 0    |
| 72     | 354   | 38    | 128   | 1228  | 522   | 12   | 1    | 2283   | 15   | 1    | 5    | 53   | 22   | 0    | 0    |
| 73     | 193   | 4     | 116   | 1154  | 305   |      |      | 1772   | 10   | 0    | 6    | 65   | 17   |      |      |
| 74     | 246   |       | 52    | 1043  | 407   |      |      | 1728   | 13   |      | 3    | 80   | 23   |      |      |
| 75     | 273   |       | 28    | 1047  | 275   |      |      | 1623   | 16   |      | 1    | 64   | 16   |      |      |
| 76     | 230   | 3     | 110   | 948   | 137   |      | 40   | 1468   | 15   | 0    | 7    | 64   | 9    |      |      |
| 77     | 156   |       | 118   | 911   | 246   | 4    |      | 1435   | 15   |      | 8    | 61   | 17   |      |      |
| 78     | 227   |       | 90    | 999   | 219   |      | 2    | 1337   | 14   |      | 2    | 64   | 14   | 0    | 0    |
| 79     | 127   |       | 50    | 500   | 168   |      |      | 745    | 17   |      | 6    | 67   | 19   |      |      |
| 80     | 126   |       | 99    | 664   | 143   | 13   |      | 1045   | 12   |      | 9    | 63   | 13   |      |      |
| 81     | 295   |       | 69    | 774   | 158   | 38   |      | 1334   | 22   |      | 5    | 58   | 11   |      |      |
| 82     | 244   |       | 164   | 861   | 155   | 48   |      | 1512   | 18   |      | 10   | 56   | 10   |      |      |
| 83     | 134   | 72    | 144   | 903   | 106   | 10   |      | 1369   | 9    | 5    | 10   | 65   | 7    |      |      |
| 84     | 181   |       | 163   | 983   | 389   | 32   |      | 1748   | 10   |      | 3    | 56   | 22   |      |      |
| 85     | 175   |       | 47    | 750   | 213   | 16   | 8    | 1209   | 14   |      | 9    | 62   | 17   |      | 0    |
| 86     | 101   |       | 67    | 783   | 57    | 17   |      | 1025   | 9    |      | 6    | 76   | 5    |      |      |
| 87     | 103   |       | 94    | 780   | 77    | 8    |      | 1017   | 10   |      | 9    | 76   | 2    |      |      |
| 88     | 160   |       | 42    | 780   | 299   | 10   |      | 1069   | 14   |      | 3    | 72   | 7    |      |      |
| 89     | 168   |       | 58    | 584   | 299   | 4    |      | 1113   | 15   |      | 5    | 52   | 26   |      |      |
| 90     | 116   |       | 62    | 470   | 72    | 3    |      | 723    | 16   |      | 8    | 65   | 9    |      |      |
| 91     | 218   |       | 32    | 464   | 117   | 5    |      | 836    | 26   |      | 3    | 55   | 13   |      |      |
| 92     | 277   |       | 26    | 618   | 266   | 9    |      | 1196   | 23   |      | 2    | 51   | 22   |      |      |
| 93     | 190   |       | 2     | 627   | 184   | 4    |      | 1007   | 18   |      | 0    | 62   | 18   |      |      |
| 94     | 174   |       | 8     | 879   | 135   |      |      | 1196   | 14   |      | 0    | 73   | 11   |      |      |
| 95     | 163   |       | 15    | 606   | 91    | 3    |      | 878    | 18   |      | 1    | 69   | 10   |      |      |
| 96     | 190   |       | 46    | 435   | 62    | 4    |      | 737    | 25   |      | 6    | 59   | 8    |      |      |
| 97     | 145   |       | 15    | 357   | 90    | 28   |      | 635    | 22   |      | 2    | 56   | 14   |      |      |
| 98     | 104   |       | 14    | 345   | 124   | 11   |      | 598    | 17   |      | 2    | 57   | 20   |      |      |
| 99     | 116   |       | 63    | 347   | 136   | 17   |      | 637    | 23   |      | 9    | 52   | 21   |      |      |
| 100    | 95    | 17    | 57    | 347   | 155   | 8    |      | 688    | 16   |      | 8    | 50   | 22   |      |      |
| 101    | 52    |       | 69    | 216   | 72    | 50   |      | 703    | 13   | 2    | 12   | 37   | 12   |      |      |
| 102    | 52    |       | 34    | 188   | 44    | 149  |      | 575    | 12   |      | 17   | 44   | 10   |      |      |
| 103    | 44    |       | 30    | 148   | 96    | 108  |      | 426    | 9    |      | 6    | 30   | 19   |      |      |
| 104    | 44    |       | 23    | 192   | 64    | 108  |      | 483    | 4    |      | 4    | 19   | 28   |      |      |
| 105    | 44    |       | 45    | 229   | 106   | 108  |      | 473    | 9    |      | 7    | 40   | 22   |      |      |
| 106    | 51    |       | 45    | 229   | 155   | 144  |      | 624    | 8    |      | 4    | 36   | 24   |      |      |
| 107    | 38    |       | 32    | 217   | 127   | 140  |      | 554    | 6    |      | 5    | 39   | 22   |      |      |
| 108    | 28    |       | 4     | 201   | 105   | 122  |      | 460    | 6    |      | 0    | 43   | 22   |      |      |
| 109    | 49    |       |       | 308   | 35    | 97   | 7    | 496    | 9    |      |      | 62   | 7    |      | 1    |
| 110    | 27    |       |       | 296   | 72    | 89   | 1    | 485    | 5    |      |      | 61   | 14   |      | 0    |
| 111    | 126   |       | 17    | 178   | 112   | 134  |      | 553    | 22   |      | 3    | 44   | 13   |      |      |
| 112    | 81    |       | 6     | 168   | 240   | 86   |      | 522    | 15   |      | 1    | 34   | 21   |      |      |
| 113    | 94    |       | 6     | 170   | 138   | 77   |      | 594    | 15   |      | 1    | 28   | 40   |      |      |
| 114    | 111   |       | 8     | 224   | 206   | 53   |      | 502    | 10   |      | 1    | 33   | 27   |      |      |
| 115    | 45    |       | 6     | 197   | 106   | 16   |      | 436    | 8    |      | 1    | 51   | 24   |      |      |
| 116    | 38    |       | 10    | 201   | 234   | 17   |      | 463    | 3    |      | 2    | 42   | 44   |      |      |
| 117    | 16    |       | 38    | 231   | 148   |      |      | 478    | 26   |      | 6    | 40   | 48   |      |      |
| 118    | 152   |       | 32    | 335   | 208   |      |      | 569    | 21   |      | 4    | 45   | 28   |      |      |
| 119    | 157   |       | 48    | 294   | 170   |      |      | 732    | 15   |      | 7    | 48   | 28   |      |      |
| 120    | 94    |       | 29    | 190   | 29    |      |      | 606    | 7    |      | 10   | 70   | 10   |      |      |
| 121    | 21    |       | 34    | 170   | 67    |      |      | 269    | 9    |      | 11   | 56   | 22   |      |      |
| 122    | 30    |       | 61    | 194   | 35    |      |      | 301    | 20   |      | 16   | 53   | 9    |      |      |
| 123    | 75    |       | 67    | 152   |       |      |      | 365    | 24   |      | 23   | 52   |      |      |      |
| 124    | 71    |       |       |       |       |      |      | 290    |      |      |      |      |      |      |      |
| TTL    | 23632 | 26913 | 12020 | 57743 | 14308 | 2979 | 633  | 138228 | 17   | 19   | 8    | 41   | 10   | 2    | 0    |

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| 17<br>2 WEEK<br>PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      | MAN-HOURS BY FUNCTION |      |       |       |      | MAN-HOURS BY FUNCTION |      |      |      |      |
|------------------------|-----------------------|------|------|------|------|-----------------------|------|-------|-------|------|-----------------------|------|------|------|------|
|                        | ADMIN                 | ANAL | DSGN | DVLP | MDIA | EVAL                  | TRNG | TOTAL | ADMIN | ANAL | DSGN                  | DVLP | MDIA | EVAL | TRNG |
| 12                     |                       |      |      |      |      |                       |      | 4     |       |      |                       |      |      |      |      |
| 13                     |                       |      |      |      |      |                       |      | 184   |       |      |                       |      |      |      |      |
| 14                     |                       |      |      |      |      |                       |      | 381   |       |      |                       |      |      |      |      |
| 15                     |                       |      |      |      |      |                       |      | 334   |       |      |                       |      |      |      |      |
| 16                     |                       |      |      |      |      |                       |      | 478   |       |      |                       |      |      |      |      |
| 17                     |                       |      |      |      |      |                       |      | 667   |       |      |                       |      |      |      |      |
| 18                     |                       |      |      |      |      |                       |      | 600   |       |      |                       |      |      |      |      |
| 19                     |                       |      |      |      |      |                       |      | 722   |       |      |                       |      |      |      |      |
| 20                     |                       |      |      |      |      |                       |      | 586   |       |      |                       |      |      |      |      |
| 21                     |                       |      |      |      |      |                       |      | 1002  |       |      |                       |      |      |      |      |
| 22                     |                       |      |      |      |      |                       |      | 857   |       |      |                       |      |      |      |      |
| 23                     |                       |      |      |      |      |                       |      | 1311  |       |      |                       |      |      |      |      |
| 24                     |                       |      |      |      |      |                       |      | 1463  |       |      |                       |      |      |      |      |
| 25                     |                       |      |      |      |      |                       |      | 1256  |       |      |                       |      |      |      |      |
| 26                     |                       |      |      |      |      |                       |      | 1079  |       |      |                       |      |      |      |      |
| 27                     |                       |      |      |      |      |                       |      | 1359  |       |      |                       |      |      |      |      |
| 28                     |                       |      |      |      |      |                       |      | 1376  |       |      |                       |      |      |      |      |
| 29                     |                       |      |      |      |      |                       |      | 1183  |       |      |                       |      |      |      |      |
| 30                     |                       |      |      |      |      |                       |      | 1134  |       |      |                       |      |      |      |      |
| 31                     |                       |      |      |      |      |                       |      | 904   |       |      |                       |      |      |      |      |
| 32                     |                       |      |      |      |      |                       |      | 846   |       |      |                       |      |      |      |      |
| 33                     |                       |      |      |      |      |                       |      | 825   |       |      |                       |      |      |      |      |
| 34                     |                       |      |      |      |      |                       |      | 870   |       |      |                       |      |      |      |      |
| 35                     |                       |      |      |      |      |                       |      | 698   |       |      |                       |      |      |      |      |
| 36                     |                       |      |      |      |      |                       |      | 666   |       |      |                       |      |      |      |      |
| 37                     |                       |      |      |      |      |                       |      | 819   |       |      |                       |      |      |      |      |
| 38                     |                       |      |      |      |      |                       |      | 946   |       |      |                       |      |      |      |      |
| 39                     |                       |      |      |      |      |                       |      | 81    |       |      |                       |      |      |      |      |
| 40                     |                       |      |      |      |      |                       |      | 1332  |       |      |                       |      |      |      |      |
| 41                     |                       |      |      |      |      |                       |      | 2003  |       |      |                       |      |      |      |      |
| 42                     |                       |      |      |      |      |                       |      | 1700  |       |      |                       |      |      |      |      |
| 43                     |                       |      |      |      |      |                       |      | 191   |       |      |                       |      |      |      |      |
| 44                     |                       |      |      |      |      |                       |      | 249   |       |      |                       |      |      |      |      |
| 45                     |                       |      |      |      |      |                       |      | 213   |       |      |                       |      |      |      |      |
| 46                     |                       |      |      |      |      |                       |      | 236   |       |      |                       |      |      |      |      |
| 47                     |                       |      |      |      |      |                       |      | 189   |       |      |                       |      |      |      |      |
| 48                     |                       |      |      |      |      |                       |      | 247   |       |      |                       |      |      |      |      |
| 49                     |                       |      |      |      |      |                       |      | 3181  |       |      |                       |      |      |      |      |
| 50                     |                       |      |      |      |      |                       |      | 3333  |       |      |                       |      |      |      |      |
| 51                     |                       |      |      |      |      |                       |      | 3090  |       |      |                       |      |      |      |      |
| 52                     |                       |      |      |      |      |                       |      | 20    |       |      |                       |      |      |      |      |
| 53                     |                       |      |      |      |      |                       |      | 2968  |       |      |                       |      |      |      |      |
| 54                     |                       |      |      |      |      |                       |      | 2695  |       |      |                       |      |      |      |      |
| 55                     |                       |      |      |      |      |                       |      | 2963  |       |      |                       |      |      |      |      |
| 56                     |                       |      |      |      |      |                       |      | 3020  |       |      |                       |      |      |      |      |
| 57                     |                       |      |      |      |      |                       |      | 2244  |       |      |                       |      |      |      |      |
| 58                     |                       |      |      |      |      |                       |      | 3184  |       |      |                       |      |      |      |      |
| 59                     |                       |      |      |      |      |                       |      | 2127  |       |      |                       |      |      |      |      |
| 60                     |                       |      |      |      |      |                       |      | 2667  |       |      |                       |      |      |      |      |
| 61                     |                       |      |      |      |      |                       |      | 3160  |       |      |                       |      |      |      |      |
| 62                     |                       |      |      |      |      |                       |      | 2823  |       |      |                       |      |      |      |      |
| 63                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 64                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 65                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 66                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 67                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 68                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 69                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |
| 70                     |                       |      |      |      |      |                       |      |       |       |      |                       |      |      |      |      |

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TABLE B-1. DISTRIBUTION OF LABOR AMONG THE 100 FUNCTIONS FOR EACH YEAR PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE RM RATING (continued)

| PERIOD | ADMIN | ANAL | USGN  | DEVLP | MUJA  | EVAL | TRNG | TOTAL  | ADMIN | ANAL | USGN | DEVLP | MUJA | EVAL | TRNG |
|--------|-------|------|-------|-------|-------|------|------|--------|-------|------|------|-------|------|------|------|
| 71     | 226   | 66   | 55    | 80    | 19    | 9    |      | 455    | 49    | 14   | 12   | 17    | 4    | 1    |      |
| 72     | 283   | 3    | 61    | 26    | 12    | 96   |      | 481    | 58    | 0    | 12   | 5     | 2    | 19   |      |
| 73     | 190   | 43   | 55    | 38    | 97    | 128  | 9    | 560    | 33    | 7    | 9    | 16    | 17   | 22   | 1    |
| 74     | 175   | 61   | 73    | 62    | 80    | 38   |      | 489    | 35    | 12   | 14   | 12    | 16   | 17   |      |
| 75     | 330   | 33   | 83    | 26    | 72    | 102  |      | 646    | 51    | 15   | 12   | 14    | 11   | 15   |      |
| 76     | 207   | 73   | 73    | 69    | 48    | 97   |      | 494    | 41    | 4    | 14   | 13    | 9    | 19   |      |
| 77     | 158   | 19   | 20    | 79    | 132   | 38   | 24   | 470    | 33    | 4    | 4    | 16    | 28   | 8    | 5    |
| 78     | 189   | 91   | 23    | 79    | 63    | 89   | 24   | 558    | 33    | 16   | 4    | 14    | 11   | 15   | 4    |
| 79     | 82    | 4    | 158   | 34    | 45    | 66   |      | 389    | 21    | 1    | 40   | 8     | 11   | 16   |      |
| 80     | 98    | 92   | 148   | 29    | 49    | 7    |      | 423    | 23    | 21   | 34   | 6     | 11   | 1    |      |
| 81     | 90    | 17   | 262   | 93    | 52    | 5    | 73   | 592    | 15    | 2    | 44   | 15    | 8    | 12   |      |
| 82     | 213   |      | 198   | 115   | 11    | 2    | 32   | 571    | 37    |      | 34   | 20    | 1    | 0    | 5    |
| 83     | 135   |      | 233   | 104   | 4     |      |      | 472    | 28    |      | 49   | 22    |      |      |      |
| 84     | 207   |      | 108   | 265   | 34    | 10   |      | 584    | 35    |      | 18   | 45    | 0    |      |      |
| 85     | 246   |      | 226   | 299   | 34    | 54   |      | 815    | 30    |      | 27   | 36    | 4    | 1    |      |
| 86     | 113   |      | 72    | 381   | 67    | 98   |      | 687    | 16    |      | 10   | 55    | 9    | 15   |      |
| 87     | 189   |      |       | 324   | 9     | 88   |      | 620    | 30    |      | 52   | 1     | 2    | 12   |      |
| 88     | 129   |      |       | 448   | 16    | 88   |      | 717    | 17    | 0    | 3    | 62    | 3    | 14   |      |
| 89     | 61    | 4    | 21    | 394   | 20    | 88   |      | 588    | 10    |      | 5    | 67    | 3    | 14   |      |
| 90     | 165   |      | 9     | 361   | 98    | 33   |      | 666    | 24    |      | 1    | 54    | 14   | 4    |      |
| 91     | 88    |      | 36    | 321   | 78    | 59   |      | 582    | 15    |      | 6    | 55    | 13   | 10   |      |
| 92     | 61    |      | 51    | 206   | 73    | 85   |      | 476    | 12    |      | 10   | 43    | 15   | 17   |      |
| 93     | 81    | 167  | 70    | 38    | 5     | 35   |      | 396    | 20    | 42   | 17   | 9     | 1    | 8    |      |
| 94     | 77    | 120  | 71    | 160   |       | 27   |      | 455    | 16    | 26   | 15   | 35    |      | 5    |      |
| 95     | 128   | 62   | 65    | 275   |       | 44   |      | 574    | 22    | 10   | 11   | 47    |      | 7    |      |
| 96     | 119   | 103  | 49    | 152   |       | 47   |      | 470    | 25    | 21   | 10   | 32    |      | 10   |      |
| 97     | 87    | 64   | 39    | 182   |       | 93   |      | 465    | 18    | 13   | 8    | 39    |      | 20   |      |
| 98     | 113   | 112  | 97    | 115   |       | 23   |      | 460    | 24    | 24   | 21   | 25    |      | 5    |      |
| 99     | 123   | 95   | 67    | 158   |       | 29   |      | 472    | 26    | 20   | 14   | 33    |      | 6    |      |
| 100    | 89    |      | 19    | 143   | 54    | 44   |      | 431    | 20    | 19   | 4    | 33    | 12   | 10   |      |
| 101    | 104   | 82   | 24    | 232   | 4     | 38   |      | 494    | 21    | 18   | 4    | 46    | 0    | 11   |      |
| 102    | 113   | 109  | 31    | 149   | 4     | 53   |      | 459    | 24    | 23   | 6    | 32    | 0    | 30   |      |
| 103    | 29    |      | 16    | 193   | 3     | 108  |      | 349    | 8     |      | 6    | 55    | 5    | 5    |      |
| 104    | 224   | 78   | 50    | 385   | 47    | 44   |      | 828    | 27    | 9    | 6    | 49    | 6    | 10   |      |
| 105    | 156   |      | 28    | 234   | 28    | 48   |      | 458    | 34    |      | 4    | 46    | 4    | 18   |      |
| 106    | 182   | 72   | 35    | 263   | 31    | 77   |      | 671    | 27    | 10   | 4    | 34    | 2    | 11   |      |
| 107    | 191   | 72   | 35    | 263   | 19    | 77   |      | 657    | 29    | 10   | 4    | 40    | 4    | 11   |      |
| 108    | 172   | 23   | 52    | 181   | 1     | 58   |      | 486    | 35    | 14   | 5    | 37    | 0    | 11   |      |
| 109    | 176   | 65   | 26    | 124   | 1     | 37   |      | 329    | 23    | 19   | 19   | 37    | 0    | 11   |      |
| 110    | 156   |      | 85    | 223   | 12    | 11   |      | 487    | 32    |      | 17   | 45    | 2    | 2    |      |
| 111    | 144   |      | 79    | 200   | 17    |      |      | 440    | 32    |      | 17   | 45    | 3    | 1    |      |
| 112    | 255   |      | 60    | 283   | 36    | 8    |      | 642    | 39    |      | 9    | 44    | 5    | 8    |      |
| 113    | 85    |      | 60    | 340   | 33    | 51   | 2    | 569    | 14    |      | 10   | 59    | 5    | 4    | 0    |
| 114    | 159   |      | 78    | 339   | 30    | 12   |      | 620    | 25    |      | 12   | 54    | 4    | 4    |      |
| 115    | 158   |      | 110   | 465   | 45    | 36   |      | 814    | 19    |      | 13   | 57    | 5    | 4    |      |
| 116    | 195   |      | 62    | 274   | 62    | 25   |      | 618    | 31    |      | 10   | 44    | 10   | 4    |      |
| 117    | 94    | 38   | 109   | 156   | 418   | 89   |      | 815    | 11    | 4    | 13   | 19    | 51   | 4    |      |
| 118    | 63    |      | 69    | 213   | 352   | 150  |      | 786    | 8     |      | 8    | 27    | 44   | 11   |      |
| 119    | 54    |      | 30    | 80    | 219   | 166  |      | 533    | 10    |      | 5    | 15    | 41   | 28   |      |
| 120    | 88    |      | 8     | 112   | 30    | 121  |      | 404    | 21    |      | 1    | 27    | 7    | 41   |      |
| 121    | 60    | 38   | 24    | 116   | 46    | 198  | 12   | 405    | 14    | 9    | 5    | 28    | 11   | 29   |      |
| 122    | 80    | 20   | 25    | 160   | 25    | 122  |      | 520    | 15    | 3    | 4    | 30    | 4    | 38   | 2    |
| 123    | 112   | 88   | 25    | 369   | 48    | 7    |      | 764    | 14    | 11   | 3    | 48    | 6    | 15   |      |
| 124    | 115   | 64   | 12    | 447   | 11    | 6    |      | 656    | 17    | 9    | 1    | 68    | 4    | 1    |      |
| 125    | 214   |      | 1     | 502   | 34    |      |      | 757    | 28    |      | 0    | 66    | 4    | 0    |      |
| TTL    | 29028 | 9225 | 11255 | 36466 | 20978 | 7823 | 1381 | 116156 | 24    | 7    | 9    | 31    | 18   | 6    | 1    |

TABLE B-1. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE RM RATING

| PM<br>2 WEEK<br>PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      | MAN-HOURS BY FUNCTION |      |                   |      |      | % MAN-HOURS BY FUNCTION |      |      |      |      |
|------------------------|-----------------------|------|------|------|------|-----------------------|------|-------------------|------|------|-------------------------|------|------|------|------|
|                        | ADMN                  | ANAL | DSGN | DVLP | MDIA | EVAL                  | TRNG | MAN-HOUR<br>TOTAL | ADMN | ANAL | DSGN                    | DVLP | MDIA | EVAL | TRNG |
| 12                     | 30                    |      |      |      |      |                       |      | 30                | 100  |      |                         |      |      |      |      |
| 13                     | 71                    |      |      |      |      |                       |      | 71                | 100  |      |                         |      |      |      |      |
| 14                     | 97                    |      |      |      |      |                       |      | 97                | 100  |      |                         |      |      |      |      |
| 15                     | 177                   | 204  |      |      |      |                       | 18   | 381               | 46   | 53   |                         |      |      |      | 1    |
| 16                     | 131                   | 760  |      |      |      |                       | 38   | 909               | 14   | 83   |                         |      |      |      | 5    |
| 17                     | 5                     | 672  |      |      |      |                       |      | 715               | 0    | 93   |                         |      |      |      |      |
| 18                     | 65                    | 894  |      |      |      |                       |      | 1004              | 6    | 89   | 4                       |      |      |      |      |
| 19                     | 112                   | 607  | 45   |      |      |                       |      | 870               | 12   | 69   | 14                      |      |      |      |      |
| 20                     | 114                   | 288  | 127  |      |      |                       |      | 858               | 13   | 33   | 47                      |      |      |      |      |
| 21                     | 206                   | 417  | 405  |      |      |                       | 16   | 1134              | 18   | 36   | 30                      |      |      |      | 1    |
| 22                     | 156                   | 333  | 268  | 144  |      |                       |      | 961               | 16   | 34   | 30                      |      |      |      |      |
| 23                     | 189                   | 430  | 213  | 307  | 43   |                       |      | 1182              | 15   | 39   | 18                      |      |      |      | 1    |
| 24                     | 129                   | 336  | 366  | 479  | 5    |                       | 24   | 1339              | 9    | 25   | 27                      |      |      |      |      |
| 25                     | 169                   | 207  | 194  | 386  | 3    |                       |      | 959               | 17   | 21   | 20                      |      |      |      | 2    |
| 26                     | 116                   | 188  | 165  | 598  | 50   |                       | 24   | 1141              | 10   | 16   | 14                      |      |      |      |      |
| 27                     | 36                    | 52   | 69   | 264  | 67   |                       | 16   | 504               | 7    | 10   | 13                      |      |      |      | 3    |
| 28                     | 149                   | 134  | 189  | 548  | 14   |                       | 40   | 1074              | 13   | 12   | 17                      |      |      |      | 3    |
| 29                     | 192                   | 109  | 257  | 679  | 299  |                       | 26   | 1562              | 12   | 5    | 16                      |      |      |      | 1    |
| 30                     | 383                   | 116  | 299  | 798  | 418  |                       | 19   | 2033              | 18   | 5    | 14                      |      |      |      | 0    |
| 31                     | 447                   | 115  | 157  | 842  | 307  |                       | 61   | 1929              | 23   | 5    | 8                       |      |      |      | 3    |
| 32                     | 637                   | 105  | 189  | 823  | 484  |                       | 40   | 2282              | 27   | 4    | 36                      |      |      |      | 1    |
| 33                     | 656                   | 78   | 196  | 833  | 483  |                       | 45   | 2332              | 29   | 3    | 33                      |      |      |      | 0    |
| 34                     | 689                   | 61   | 191  | 811  | 624  |                       | 12   | 2388              | 28   | 2    | 7                       |      |      |      | 1    |
| 35                     | 722                   | 39   | 171  | 1030 | 587  |                       | 32   | 2593              | 27   | 1    | 6                       |      |      |      | 0    |
| 36                     | 757                   | 39   | 108  | 1040 | 503  |                       | 38   | 2593              | 28   | 0    | 4                       |      |      |      | 1    |
| 37                     | 748                   | 60   | 102  | 987  | 598  |                       | 80   | 2663              | 28   | 2    | 3                       |      |      |      | 2    |
| 38                     | 846                   | 24   | 112  | 924  | 821  |                       | 64   | 2591              | 24   | 0    | 4                       |      |      |      | 2    |
| 39                     | 843                   | 39   | 166  | 1207 | 1045 |                       | 102  | 3390              | 24   | 1    | 4                       |      |      |      | 0    |
| 40                     | 591                   | 17   | 127  | 1043 | 1795 |                       |      | 3675              | 16   | 0    | 3                       |      |      |      | 2    |
| 41                     | 516                   | 13   | 166  | 1122 | 1264 |                       |      | 3081              | 16   | 0    | 5                       |      |      |      | 1    |
| 42                     | 754                   |      | 158  | 1040 | 1794 |                       |      | 3802              | 19   |      | 4                       |      |      |      | 3    |
| 43                     | 779                   |      | 149  | 999  | 1690 |                       |      | 3818              | 20   |      | 3                       |      |      |      | 0    |
| 44                     | 644                   |      | 88   | 963  | 667  |                       | 56   | 2447              | 26   |      | 3                       |      |      |      | 3    |
| 45                     | 611                   |      | 193  | 491  | 419  |                       | 78   | 1792              | 24   |      | 10                      |      |      |      | 3    |
| 46                     | 361                   |      | 221  | 288  | 405  |                       | 54   | 1469              | 34   |      | 15                      |      |      |      | 2    |
| 47                     | 230                   |      | 93   | 365  | 544  |                       | 40   | 1045              | 15   |      | 5                       |      |      |      | 3    |
| 48                     | 317                   |      | 73   | 317  | 132  |                       |      | 1108              | 30   |      | 8                       |      |      |      | 3    |
| 49                     | 308                   |      | 82   | 359  | 253  |                       |      | 1104              | 27   |      | 7                       |      |      |      | 2    |
| 50                     | 223                   |      | 82   | 359  | 275  |                       |      | 947               | 20   |      | 8                       |      |      |      |      |
| 51                     | 220                   |      | 116  | 329  | 184  |                       |      | 1086              | 23   |      | 10                      |      |      |      |      |
| 52                     | 318                   |      | 126  | 140  | 140  |                       | 4    | 724               | 29   |      | 10                      |      |      |      | 0    |
| 53                     | 205                   |      | 158  | 184  | 53   |                       | 4    | 886               | 28   | 3    | 14                      |      |      |      | 0    |
| 54                     | 202                   |      | 161  | 173  | 54   |                       |      | 1037              | 29   |      | 15                      |      |      |      |      |
| 55                     | 326                   |      | 161  | 184  | 94   |                       |      | 1029              | 36   |      | 15                      |      |      |      |      |
| 56                     | 327                   |      | 187  | 114  | 104  |                       |      | 1176              | 29   |      | 15                      |      |      |      |      |
| 57                     | 324                   |      | 114  | 199  | 56   |                       |      | 1105              | 42   |      | 7                       |      |      |      |      |
| 58                     | 335                   |      | 114  | 274  | 105  |                       |      | 1105              | 30   |      | 10                      |      |      |      |      |
| 59                     | 359                   |      | 113  | 319  | 105  |                       |      | 983               | 37   |      | 11                      |      |      |      |      |
| 60                     | 327                   |      | 93   | 441  | 189  |                       |      | 1056              | 35   |      | 10                      |      |      |      |      |
| 61                     | 403                   |      | 88   | 578  | 340  |                       |      | 1387              | 29   |      | 6                       |      |      |      |      |
| 62                     | 340                   |      | 80   | 558  | 262  |                       |      | 1483              | 22   |      | 5                       |      |      |      |      |
| 63                     | 460                   |      | 106  | 255  | 155  |                       | 8    | 1269              | 31   |      | 8                       |      |      |      |      |
| 64                     | 249                   |      | 120  | 146  | 26   |                       |      | 1156              | 33   |      | 10                      |      |      |      | 0    |
| 65                     | 386                   |      | 64   | 86   | 20   |                       |      | 912               | 11   |      | 7                       |      |      |      | 1    |
| 66                     | 502                   |      | 128  | 24   | 136  |                       | 15   | 873               | 55   |      | 2                       |      |      |      |      |
| 67                     | 501                   |      | 188  | 72   | 143  |                       |      | 841               | 55   |      | 0                       |      |      |      |      |
| 68                     | 399                   |      | 152  | 87   | 67   |                       |      | 797               | 46   |      | 9                       |      |      |      |      |
| 69                     | 433                   |      |      |      |      |                       |      |                   | 54   |      |                         |      |      |      |      |
| 70                     |                       |      |      |      |      |                       |      |                   |      |      |                         |      |      |      |      |

APPENDIX B

MANPOWER UTILIZATION



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TABLE A-6. INSTRUCTIONAL SYSTEMS DEVELOPMENT EXPENDITURES  
BY RATING FOR THE PERIOD 1976 TO SEPTEMBER 1980  
(\$1,000)

|                      | Military<br>Labor | Civilian<br>Labor | Material | Contract | Other   | Overhead | Total     |
|----------------------|-------------------|-------------------|----------|----------|---------|----------|-----------|
| RM                   | \$ 48.4           | \$ 838.0          | \$ 65.0  | \$ 157.9 | \$101.7 | \$ 870.7 | \$2,081.7 |
| DS                   | 38.4              | 161.9             | 1.7      | 0.1      | 3.6     | 151.2    | 356.9     |
| IC                   | 212.3             | 1,388.8           | 85.4     | 267.9    | 86.8    | 1,156.1  | 3,197.3   |
| ST                   | 126.7             | 536.1             | 22.7     | 2.0      | 14.6    | 408.9    | 1,111.0   |
| ET                   | 189.8             | 560.0             | 244.4    | 458.2    | 83.0    | 609.5    | 2,144.9   |
| HT                   | 62.7              | 258.1             | 16.1     | 0.8      | 33.5    | 209.9    | 581.1     |
| EM                   | 19.1              | 273.3             | 3.6      | 870.3    | 1.9     | 355.2    | 1,523.4   |
| FA                   | 37.2              | 431.5             | 97.3     | 126.9    | 69.3    | 781.5    | 1,543.7   |
| EO                   | 95.7              | 101.8             | 0.1      | 0.0      | 0.1     | 138.1    | 335.8     |
| CM                   | 19.5              | 13.1              | 0.1      | 0.0      | 0.0     | 28.5     | 61.2      |
| UT                   | 24.6              | 35.2              | 0.0      | 0.0      | 0.0     | 43.2     | 103.0     |
| EA                   | 8.9               | 10.4              | 0.1      | 0.0      | 0.1     | 15.0     | 34.5      |
| BU                   | 10.7              | 4.6               | 0.0      | 0.0      | 0.0     | 13.3     | 28.6      |
| SW                   | 7.2               | 4.0               | 0.0      | 0.0      | 0.0     | 8.9      | 20.1      |
| CE                   | 5.6               | 2.6               | 0.0      | 0.0      | 0.0     | 6.5      | 14.7      |
| DP                   | 180.8             | 315.0             | 35.2     | 6.2      | 6.1     | 353.7    | 897.0     |
| SA                   | 55.3              | 325.4             | 124.8    | 2.7      | 89.1    | 234.0    | 831.3     |
| AA                   | 47.2              | 340.7             | 83.5     | 0.0      | 25.0    | 229.2    | 725.6     |
| FT                   | 4.2               | 41.4              | 14.2     | 0.0      | 0.0     | 21.5     | 81.3      |
| BE&E                 | 0                 | 126.2             | 34.0     | 0.0      | 50.0    | 56.4     | 266.6     |
| EW                   | 666.9             | 842.6             | 373.3    | 4,010.6  | 24.5    | 1,257.1  | 7,175.0   |
| CT                   | 64.8              | 34.2              | 19.7     | 1,902.9  | 8.9     | 91.4     | 2,121.9   |
| IT                   | 91.4              | 181.3             | 0.1      | 700.2    | 26.1    | 186.0    | 1,185.9   |
| RT                   | 11.1              | 22.9              | 0.0      | 0.0      | 0.0     | 20.1     | 54.1      |
| MM                   | 0.0               | 2.7               | 0.0      | 0.0      | 0.0     | 1.2      | 3.9       |
| BT                   | 0.0               | 3.6               | 0.0      | 0.0      | 0.0     | 1.6      | 5.2       |
| PE                   | 22.1              | 65.7              | 0.0      | 0.0      | 0.0     | 45.2     | 133.0     |
| GM                   | 6.4               | 4.6               | 0.0      | 0.0      | 0.0     | 6.6      | 17.6      |
| RM (Maint)           | 32.6              | 307.5             | 9.2      | 1.9      | 65.8    | 218.6    | 635.6     |
| Existing<br>Programs | 0.0               | 144.1             | 1,658.6  | 542.7    | 619.4   | 0.0      | 2,964.8   |
| Other                | 38.9              | 368.9             | 60.5     | 62.2     | 97.5    | 289.1    | 917.1     |
| TOTAL                | 2,128.5           | 7,746.2           | 2,949.6  | 9,113.5  | 1,407.0 | 7,809.0  | 31,153.8  |

TABLE A-5. SUMMARY PERFORMANCE DATA FOR IPDCs THROUGH SEPTEMBER 1980

|            | MAN-HOURS |         |         |         | Total<br>Expendi-<br>tures<br>(\$1,000) | Projected Percent<br>Change<br>in Contact<br>Hours |       |                      |       | Equivalent<br>Hrs Complete |         | Total<br>Labor<br>Costs |
|------------|-----------|---------|---------|---------|---|--|-------|----------------------|-------|----------------------------|---------|-------------------------|
|            | G.L.      |         | S.D.    |         |   | Original<br>Contact<br>Hours                       |       | Completed<br>Percent |       | Hrs Original               | Revised |                         |
|            | S.D.      | G.L.    | S.D.    | G.L.    |   | Hours  | Hours | Hours                | Hours |                            |         |                         |
| RM         | 84,831    |         | 43,504  |         | \$2,082                                 | 396  | 396   | 0                    | 100   | 396                        | 396     | 886                     |
| DS         | 18,582    |         | 9,529   |         | 357                                     | 931  | NC*   | -                    | -     | -                          | -       | 200                     |
| IC         | 139,411   |         | 71,495  |         | 3,197                                   | 295  | 252   | -14                  | 96    | 284                        | 242     | 1,601                   |
| ST         | 59,156    |         | 30,337  |         | 1,111                                   | 300  | 270   | -10                  | 99    | 297                        | 270     | 663                     |
| ET         | 24,572    | 47,309  | 12,601  | 40,240  | 2,145                                   | 848  | 840   | -01                  | 91    | 772                        | 765     | 750                     |
| HT         | 31,499    |         | 16,154  |         | 581                                     | 426  | 385   | -10                  | 73    | 311                        | 281     | 321                     |
| EM         | 240       | 25,610  | 123     | 21,783  | 1,523                                   | 213  | 322   | +51                  | 70    | 149                        | 225     | 292                     |
| FA         | 28,564    | 28,564  |         | 24,296  | 1,544                                   | 85   | 140   | +60                  | 99    | 85                         | 140     | 469                     |
| EO         | 16,814    |         | 8,623   |         | 336                                     | 240  | NC    | -                    | 96    | 230                        | 230     | 198                     |
| CM         | 3,394     |         | 1,741   |         | 61                                      | 355  | NC    | -                    | 10**  | 10                         | 10      | 33                      |
| UT         | 6,240     |         | 3,200   |         | 103                                     | 298  | NC    | -                    | 10    | 10                         | 10      | 60                      |
| EA         | 1,912     |         | 981     |         | 35                                      | 312  | NC    | -                    | 60    | 10                         | 10      | 19                      |
| BU         | 1,797     |         | 922     |         | 29                                      | 251  | NC    | -                    | 10    | 10                         | 10      | 15                      |
| SW         | 1,307     |         | 670     |         | 20                                      | 365  | NC    | -                    | 10    | 10                         | 10      | 11                      |
| CE         | 1,153     |         | 591     |         | 15                                      | 217  | NC    | -                    | 10    | 10                         | 10      | 8                       |
| DP         | 49,853    |         | 25,566  |         | 897                                     | 312  | 280   | -10                  | 92    | 258                        | 258     | 496                     |
| SA         | 32,100    |         | 16,462  |         | 831                                     | 85   | 140   | +60                  | 96    | 81                         | 134     | 381                     |
| AA         |           | 35,080  |         | 29,838  | 726                                     | 85   | 140   | +60                  | 95    | 81                         | 133     | 388                     |
| FT         |           | 3,944   |         | 13,355  | 81                                      | 455  | NC    | -                    | 16    | -                          | -       | 46                      |
| BE&E       | 252       | 14,934  | 129     | 12,703  | 267                                     | NEW  | 91    | -                    | 99    | 90                         | 90      | 126                     |
| EW         | 1,895     |         | 972     |         | 7,175                                   | 5,960  | NC    | -                    | 10    | 10                         | 10      | 1,510                   |
| CT         |           |         |         |         | 2,122                                   | 284  | NC    | -                    | 10    | 10                         | 10      | 99                      |
| IT         |           |         |         |         | 1,186                                   | 449  | 350   | -22                  | 10    | 10                         | 10      | 273                     |
| RT         | 3,958     |         | 2,030   |         | 54                                      | NC   | NC    | -                    | 10    | 10                         | 10      | 34                      |
| MM         |           | 214     |         | 182     | 4                                       | 190  | NC    | -                    | 10    | 10                         | 10      | 3                       |
| BT         | 25        | 248     | 13      | 211     | 5                                       | 240  | NC    | -                    | 10    | 10                         | 10      | 4                       |
| PE         |           | 8,102   |         | 6,891   | 133                                     | 125  | NC    | -                    | 10    | 10                         | 10      | 88                      |
| GM         |           | 1,407   |         | 1,197   | 18                                      |  | NC    | -                    | 10    | 10                         | 10      | 11                      |
| SUBTOTAL   | 478,991   | 165,412 | 245,643 | 140,696 | 26,638                                  | 14,407   |       |                      |       |                            |         |                         |
| EXIST      |           |         |         |         | 2,965                                   |  |       |                      |       |                            |         | 144                     |
| RM (Maint) | 31,325    |         | 16,065  |         | 636                                     |  |       |                      |       |                            |         | 340                     |
| FA (Maint) |           | 13,934  |         | 11,852  |   |  |       |                      |       |                            |         |                         |
| OTHER      | 14,121    | 0       | 7,243   | 0       | 917                                     |  |       |                      |       |                            |         | 408                     |
| NONIPO     | 164,472   | 23,559  | 84,347  | 20,039  |   |  |       |                      |       |                            |         |                         |
| SUBTOTAL   | 209,918   | 37,493  | 107,655 | 31,891  | 4,518                                   |  |       |                      |       |                            |         |                         |
| TOTAL      | 688,909   | 202,905 | 353,298 | 172,587 | 31,156                                  | 14,407   |       |                      |       |                            |         | 9,877                   |

\* NC = Not complete  
 \*\* ID = Insufficient data

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TABLE A-4. RELATIONSHIP OF COURSES AND CONTACT HOURS TO THE PERCENT OF TRAINING DAYS FOR TYPE "F" NAVEDTRACOM COURSES

| Number of Courses | Training Days (1,000) | Percent of Total Training Days | Cumulative Contact Hrs. | Percent of Total Hrs. |
|-------------------|-----------------------|--------------------------------|-------------------------|-----------------------|
| 2                 | 86                    | 5                              | 14                      | 0.03                  |
| 4                 | 174                   | 10                             | 40                      | 0.07                  |
| 9                 | 347                   | 20                             | 172                     | 0.33                  |
| 14                | 521                   | 30                             | 244                     | 0.47                  |
| 24                | 695                   | 40                             | 572                     | 1.10                  |
| 53                | 868                   | 50                             | 1,355                   | 2.61                  |
| 101               | 1,042                 | 60                             | 2,959                   | 5.70                  |
| 161               | 1,216                 | 70                             | 5,674                   | 10.93                 |
| 267               | 1,389                 | 80                             | 10,350                  | 19.94                 |
| 465               | 1,563                 | 90                             | 19,540                  | 37.65                 |
| 1,146             | 1,737                 | 100                            | 51,900                  | 100.00                |

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TABLE A-2. RELATIONSHIP OF COURSES AND CONTACT HOURS TO THE PERCENT OF TOTAL TRAINING DAYS FOR TYPE "A" NAVEDTRACOM COURSES

| Number of Courses | Training Days (1,000) | Percent of Total Training Days | Cumulative Contact Hrs. | Percent of Total Hrs. |
|-------------------|-----------------------|--------------------------------|-------------------------|-----------------------|
| 1                 | 470                   | 5                              | 139                     | 0.18                  |
| 4                 | 942                   | 10                             | 388                     | 0.50                  |
| 8                 | 1,885                 | 20                             | 1,307                   | 1.70                  |
| 10                | 2,827                 | 30                             | 1,307                   | 1.70                  |
| 18                | 3,770                 | 40                             | 2,833                   | 3.68                  |
| 29                | 4,712                 | 50                             | 5,474                   | 7.10                  |
| 43                | 5,655                 | 60                             | 9,509                   | 12.34                 |
| 54                | 6,597                 | 70                             | 14,628                  | 18.98                 |
| 70                | 7,540                 | 80                             | 21,092                  | 27.36                 |
| 104               | 8,482                 | 90                             | 33,494                  | 43.45                 |
| 233               | 9,425                 | 100                            | 77,087                  | 100.00                |

TABLE A-3. RELATIONSHIP OF COURSES AND CONTACT HOURS TO THE PERCENT OF TOTAL TRAINING DAYS FOR TYPE "C" NAVEDTRACOM COURSES

| Number of Courses | Training Days (1,000) | Percent of Total Training Days | Cumulative Contact Hrs. | Percent of Total Hrs. |
|-------------------|-----------------------|--------------------------------|-------------------------|-----------------------|
| 4                 | 242                   | 5                              | 372                     | 0.09                  |
| 7                 | 485                   | 10                             | 668                     | 0.16                  |
| 20                | 969                   | 20                             | 2,030                   | 0.50                  |
| 41                | 1,454                 | 30                             | 7,646                   | 1.88                  |
| 78                | 1,939                 | 40                             | 15,967                  | 3.93                  |
| 125               | 2,424                 | 50                             | 27,950                  | 6.88                  |
| 220               | 2,908                 | 60                             | 47,760                  | 11.76                 |
| 308               | 3,393                 | 70                             | 73,990                  | 18.22                 |
| 458               | 3,878                 | 80                             | 109,301                 | 26.92                 |
| 636               | 4,362                 | 90                             | 161,731                 | 39.83                 |
| 1,510             | 4,847                 | 100                            | 406,095                 | 100.00                |

TABLE A-1. SUMMARY OF OUTPUT DATA FOR SELECTED COURSES AND/OR COURSE MODULES

| Category                                      | Course/Module |      |     |     |    |     |     |     |     |       |       |       |
|---|---------------|------|-----|-----|----|-----|-----|-----|-----|-------|-------|-------|
|   | BE&E          | FA   | AA  | DP  | DF | ET  | IC  | RM  | SA  | ST-23 | ST-26 | ST-53 |
| Instruction Hours                             |               |      |     |     |    |     |     |     |     |       |       |       |
| New Development                               | 111           | 54   | 104 | 123 | 60 | 840 | 137 | 267 | 108 | 115   | 124   | 124   |
| Revised Development                           | -             | 12   | 36  | 96  | -  | 0   | 37  | 90  | -   | -     | -     | -     |
| Validation Only                               | -             | -    | -   | 16  | -  | 0   | -   | 48  | 7   | -     | -     | -     |
| TOTAL   | 111           | 66   | 140 | 235 | -  | 840 | 174 | 405 | 115 | 115   | 124   | 124   |
| Type Material (Hours)                         |               |      |     |     |    |     |     |     |     |       |       |       |
| Audio-Visual                                  | 1             | 4.75 | 2.5 | 28  | -  | *   | 5   | 11  | 10  | 11    | 0.1   | -     |
| Tests   | 10            | 15   | -   | -   | 12 | *   | -   | 45  | -   | 9     | 20    | 20    |
| Labs  | 60            | 26   | -   | 12  | -  | *   | 25  | 250 | 49  | 59    | 68    | 68    |
| Other   | -             | 30   | -   | 144 | -  | *   | -   | -   | -   | -     | -     | -     |
| Type Delivery                                 |               |      |     |     |    |     |     |     |     |       |       |       |
| Group-Paced**<br>(Percent)                    | 0             | 100  | 100 | 100 | 50 | 100 | 0   | 0   | 100 | 60    | 60    | 60    |
| Self-Paced**<br>(Percent)                     | 100           | 0    | 0   | 0   | 50 | 0   | 100 | 100 | 0   | 40    | 40    | 40    |
| Average Student<br>Completion Time<br>(Hours) | 100           | 130  | 140 | 284 | 30 | 140 | 228 | 363 | 120 | 96    | *     | 112   |

\* Missing Data

\*\* Estimated

APPENDIX A

SUMMARY COST AND PRODUCTIVITY DATA

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CNET Instruction 1550.5, of 11 March 1974, subj: Instructional Systems Development; Policy and Doctrine for.

CNET Instruction 1550.12, of 29 August 1977, subj: Validation Standards for Instructional Program Development (IPD).

CNET Instruction 1550.13A, of 25 July 1978, subj: Instructional Program Development Responsibilities and Approval Procedures.

CNET Instruction 1552.1, of 9 April 1973, subj: Development of Training Materials.

CNET SUPPORT Notice 1550, of 28 October 1976, subj: Introduction to Instructional System Development, Calendar Year 1977 Course Schedule.

CNET SUPPORT Instruction 1550.5, of 2 February 1978, subj: IPD Management Planning, Reporting, and Program Evaluation System; Guidelines and Procedures for Administration and Management of.

CNET SUPPORT Instruction 1550.6, of 19 January 1978, subj: Instructional Program Development; Policies and Guidance Concerning.

CNET SUPPORT Instruction 5450.6B, of 20 September 1976, subj: Naval Education and Training Support Center Pacific: Mission and Functions.

CNET SUPPORT Instruction 5450.10C, of 12 January 1978, subj: Naval Education and Training Program Development Center, Pensacola, Florida; Mission and Function of.

CNET SUPPORT Instruction 5450.11A, of 30 June 1978, subj: Naval Education and Training Support Center Atlantic; Mission and Functions.

CNET SUPPORT Instruction 5450.14A, of 13 April 1978, subj: Management Information and Instructional System Activity; Mission and Functions.

CNET SUPPORT Instruction 7400.1, of 27 June 1978, subj: Man-Hour Accounting for IPD; Policy and Procedure for.

CNET Notice 1500, of 12 May 1978, subj: Process (Internal) Evaluation of ISD.

DECISION MEMORANDUM FOR RECORD NO. 1, 12 December 1974, Centralized Management of Instructional Development, VADM James B. Wilson.

DECISION MEMORANDUM FOR RECORD NO. 2, 27 April 1976, Establishment of Instructional Program Development Centers, VADM James B. Wilson.



TABLE B-3. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE ST RATING (continued)

| PERIOD | ADMN | ANAL  | DSGN | DVLP  | MDIA | EVAL | TRNG | TOTAL | ADMN | ANAL | DSGN | DVLP | MDIA | EVAL | TRNG |
|--------|------|-------|------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| 71     | 25   | 318   | 3    | 12    |      |      |      | 346   | 7    | 91   | 0    |      |      |      |      |
| 72     | 29   | 410   | 13   |       |      |      |      | 464   | 6    | 88   | 2    |      |      |      |      |
| 73     | 27   | 413   | 7    |       |      |      |      | 447   | 6    | 92   | 1    |      |      |      |      |
| 74     | 84   | 432   |      |       |      |      | 13   | 529   | 15   | 81   |      |      |      |      | 2    |
| 75     | 134  | 407   |      | 16    | 1    |      | 59   | 617   | 21   | 65   |      | 2    |      |      | 9    |
| 76     | 185  | 546   |      | 9     | 2    |      | 1    | 743   | 24   | 73   |      | 1    | 0    |      | 0    |
| 77     | 54   | 203   | 313  | 1     | 23   |      |      | 594   | 9    | 34   | 52   | 0    | 3    |      | 0    |
| 78     | 57   | 117   | 564  |       |      |      | 2    | 740   | 7    | 15   | 76   |      |      |      | 0    |
| 79     | 16   | 38    | 237  |       |      |      |      | 291   | 5    | 13   | 81   |      |      |      |      |
| 80     | 52   |       | 686  |       |      |      |      | 738   | 7    |      | 92   |      |      |      |      |
| 81     | 71   | 30    | 543  |       |      |      |      | 828   | 8    |      | 77   |      |      |      | 9    |
| 82     | 145  | 22    | 587  | 8     |      |      | 76   | 843   | 17   | 3    | 69   | 0    |      |      | 0    |
| 83     | 102  | 217   | 401  | 83    |      |      | 6    | 740   | 10   | 29   | 54   |      |      |      |      |
| 84     | 102  | 121   | 487  | 132   | 23   |      | 2    | 867   | 11   | 13   | 56   |      |      |      | 0    |
| 85     | 72   | 6     | 532  | 86    |      |      |      | 770   | 9    | 0    | 69   |      |      |      |      |
| 86     | 57   |       | 208  | 600   |      |      |      | 930   | 6    | 1    | 22   |      |      |      |      |
| 87     | 101  | 15    | 91   | 648   | 98   |      | 23   | 988   | 10   |      | 9    |      |      |      | 2    |
| 88     | 106  |       | 145  | 524   | 449  | 12   | 12   | 1270  | 8    |      | 11   |      |      |      | 0    |
| 89     | 121  |       | 61   | 667   | 127  | 34   | 12   | 1000  | 12   |      | 6    |      |      |      | 0    |
| 90     | 142  |       | 1    | 584   | 250  | 51   | 2    | 1028  | 13   |      | 0    |      |      |      | 0    |
| 91     | 83   |       | 40   | 496   | 367  | 12   |      | 1111  | 7    |      | 3    |      |      |      |      |
| 92     | 121  |       | 3    | 489   | 89   | 93   |      | 795   | 15   |      | 0    |      |      |      |      |
| 93     | 218  |       | 4    | 296   | 87   | 78   | 3    | 686   | 31   |      | 0    |      |      |      | 0    |
| 94     | 77   |       | 2    | 91    | 48   | 433  |      | 651   | 11   |      | 0    |      |      |      |      |
| 95     | 62   |       |      | 40    | 2    | 412  |      | 527   | 11   |      |      |      |      |      |      |
| 96     | 106  |       |      | 20    | 77   | 266  | 10   | 557   | 19   | 2    |      |      |      |      | 2    |
| 97     | 61   |       | 94   | 86    | 29   | 125  | 5    | 415   | 14   | 15   | 22   |      |      |      |      |
| 98     | 340  | 386   |      | 233   | 74   | 13   |      | 1016  | 33   | 37   | 20   |      |      |      | 0    |
| 99     | 203  | 406   |      | 153   | 74   | 13   |      | 854   | 23   | 47   | 17   |      |      |      |      |
| 100    | 122  | 135   | 250  | 78    | 25   | 5    |      | 520   | 26   | 17   | 48   |      |      |      |      |
| 101    | 209  |       | 238  | 162   | 135  |      |      | 779   | 21   | 13   | 30   |      |      |      |      |
| 102    | 156  | 94    | 294  | 112   | 64   |      |      | 720   | 34   | 3    | 40   |      |      |      |      |
| 103    | 273  | 24    | 229  | 235   | 22   |      |      | 783   | 20   | 3    | 29   |      |      |      |      |
| 104    | 155  | 29    | 203  | 348   | 20   |      |      | 755   | 20   | 3    | 26   |      |      |      |      |
| 105    | 115  | 23    | 136  | 206   | 6    |      |      | 486   | 23   | 4    | 27   |      |      |      |      |
| 106    | 211  | 101   | 112  | 392   | 18   |      |      | 834   | 25   | 12   | 13   |      |      |      |      |
| 107    | 207  | 59    | 124  | 540   | 41   |      |      | 971   | 21   | 6    | 12   |      |      |      |      |
| 108    | 171  | 16    | 86   | 449   | 119  | 4    |      | 845   | 20   | 1    | 10   |      |      |      |      |
| 109    | 201  |       | 39   | 539   | 33   |      |      | 814   | 24   | 0    | 4    |      |      |      |      |
| 110    | 276  |       | 38   | 765   | 156  |      |      | 1205  | 22   | 0    | 3    |      |      |      |      |
| 111    | 252  | 4     | 12   | 848   | 137  |      |      | 1253  | 20   | 0    | 0    |      |      |      |      |
| 112    | 233  |       | 21   | 755   | 112  | 4    |      | 1125  | 20   | 13   | 0    |      |      |      |      |
| 113    | 181  | 120   | 3    | 404   | 166  | 1    |      | 875   | 20   | 13   | 0    |      |      |      |      |
| 114    | 344  | 144   | 7    | 408   | 124  | 17   |      | 1044  | 32   | 13   | 0    |      |      |      |      |
| 115    | 221  | 95    | 17   | 487   | 203  | 8    |      | 1031  | 21   | 9    | 1    |      |      |      |      |
| 116    | 155  | 11    | 23   | 449   | 278  | 22   |      | 938   | 16   | 1    | 2    |      |      |      |      |
| 117    | 181  | 81    | 204  | 457   | 233  | 17   |      | 1173  | 15   | 6    | 17   |      |      |      |      |
| 118    | 247  | 160   | 159  | 404   | 231  | 113  | 7    | 1181  | 20   | 13   | 13   |      |      |      | 0    |
| 119    | 178  | 207   | 85   | 378   | 26   | 6    |      | 880   | 20   | 32   | 9    |      |      |      |      |
| 120    | 201  | 431   |      | 459   | 255  | 5    |      | 1331  | 15   | 30   | 12   |      |      |      |      |
| 121    | 164  | 331   | 130  | 317   | 128  |      |      | 1075  | 15   | 29   | 19   |      |      |      |      |
| 122    | 158  | 292   | 187  | 224   | 15   | 103  |      | 979   | 16   | 34   | 15   |      |      |      |      |
| 123    | 200  | 328   | 153  | 149   | 53   | 80   |      | 963   | 20   | 48   | 17   |      |      |      |      |
| 124    | 226  | 532   | 187  | 113   | 42   |      |      | 1100  | 19   | 51   | 18   |      |      |      |      |
| 125    | 254  | 653   | 233  | 172   | 54   |      | 6    | 1272  | 19   | 51   | 18   |      |      |      |      |
| TTL    | 9848 | 19048 | 8301 | 14971 | 4345 | 2415 | 228  | 59156 | 16   | 32   | 14   | 25   | 7    | 4    | 0    |

TABLE B-4. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE HT RATING

| HT<br>2 WEEK<br>PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      |      | MAN-<br>HOURS<br>TOTAL | % MAN-HOURS BY FUNCTION |       |      |      |      |      |      |
|------------------------|-----------------------|------|------|------|------|------|------------------------|-------------------------|-------|------|------|------|------|------|
|                        | ADMIN                 | ANAL | DSGN | DVLP | MOIA | EVAL |                        | TRNG                    | ADMIN | ANAL | DSGN | DVLP | MOIA | EVAL |
| 12                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 13                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 14                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 15                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 16                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 17                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 18                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 19                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 20                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 21                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 22                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 23                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 24                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 25                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 26                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 27                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 28                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 29                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 30                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 31                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 32                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 33                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 34                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 35                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 36                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 37                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 38                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 39                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 40                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 41                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 42                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 43                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 44                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 45                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 46                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 47                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 48                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 49                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 50                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 51                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 52                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 53                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 54                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 55                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 56                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 57                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 58                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 59                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 60                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 61                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 62                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 63                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 64                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 65                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 66                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 67                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 68                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 69                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |
| 70                     |                       |      |      |      |      |      |                        |                         |       |      |      |      |      |      |

TABLE B-4. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE HT RATING (continued)

| PERIOD | ADRN | ANAL  | DSGN | DVLP  | MDIA | EVAL | TRNG | TOTAL | ADRN | ANAL | DSGN | DVLP | MDIA | EVAL | TRNG |
|--------|------|-------|------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| 71     | 8    | 208   |      |       |      |      |      | 216   | 3    | 96   |      |      |      |      |      |
| 72     | 10   | 220   |      |       |      |      |      | 230   | 4    | 95   |      |      |      |      |      |
| 73     | 4    | 377   |      | 14    |      |      |      | 395   | 5    | 73   | 5    | 3    |      |      |      |
| 74     | 21   | 289   | 23   | 58    |      |      |      | 391   | 5    | 78   |      | 14   |      |      |      |
| 75     | 30   | 429   |      | 64    |      |      | 11   | 544   | 15   | 71   |      | 12   |      |      | 2    |
| 76     | 82   | 367   |      | 21    |      |      |      | 513   | 4    | 88   |      | 15   |      |      |      |
| 77     | 16   | 293   |      | 64    |      |      |      | 330   | 13   | 80   |      | 6    |      |      |      |
| 78     | 35   | 320   |      | 21    |      |      |      | 419   | 13   | 76   |      | 15   |      |      |      |
| 79     | 41   | 248   |      | 21    |      |      |      | 310   | 13   | 71   |      | 15   |      |      |      |
| 80     | 29   | 280   | 24   | 61    |      |      |      | 394   | 9    | 72   |      | 17   |      |      |      |
| 81     | 40   | 307   |      | 72    |      |      |      | 419   | 11   | 73   |      | 15   |      |      |      |
| 82     | 40   | 244   |      | 53    |      |      |      | 337   | 16   | 66   |      | 17   |      |      |      |
| 83     | 53   | 210   |      | 55    |      |      |      | 318   | 20   | 61   |      | 18   |      |      |      |
| 84     | 87   | 263   |      | 79    |      |      |      | 429   | 37   | 46   |      | 16   |      |      |      |
| 85     | 160  | 201   |      | 64    |      |      | 5    | 432   | 11   | 69   |      | 17   |      |      | 1    |
| 86     | 41   | 247   |      | 89    |      |      |      | 357   | 38   | 55   |      | 4    |      |      |      |
| 87     | 63   | 77    | 4    | 8     | 1    |      |      | 165   | 44   | 44   | 2    | 10   |      |      |      |
| 88     | 61   | 77    |      | 8     |      |      |      | 133   | 35   | 64   |      | 6    |      |      |      |
| 89     | 35   | 35    |      | 5     |      |      |      | 76    | 26   | 67   |      |      |      |      |      |
| 90     | 19   | 51    |      |       |      |      |      | 70    | 24   | 75   |      |      |      |      |      |
| 91     | 20   | 51    |      |       |      |      |      | 76    | 24   | 75   |      |      |      |      |      |
| 92     | 9    | 28    |      |       |      |      |      | 32    | 100  |      |      |      |      |      |      |
| 93     | 32   | 223   |      | 75    |      |      |      | 368   | 16   | 60   |      | 20   |      |      |      |
| 94     | 61   | 270   | 9    | 188   |      |      |      | 500   | 46   | 46   |      | 17   |      |      |      |
| 95     | 20   | 163   | 12   | 188   |      |      |      | 386   | 30   | 47   |      | 17   |      |      |      |
| 96     | 29   | 199   | 18   | 125   |      |      |      | 350   | 40   | 42   |      | 35   |      |      |      |
| 97     | 55   | 178   | 174  | 168   |      |      |      | 513   | 30   | 30   |      | 29   |      |      |      |
| 98     | 58   | 276   | 161  | 38    | 5    |      |      | 513   | 31   | 52   |      | 16   |      |      |      |
| 99     | 103  | 303   | 273  | 94    |      |      |      | 741   | 12   | 29   |      | 32   |      |      |      |
| 100    | 55   | 215   | 222  | 159   |      |      |      | 738   | 36   | 1    |      | 21   |      |      |      |
| 101    | 101  | 45    | 242  | 263   | 40   |      |      | 1262  | 8    | 1    |      | 35   |      |      |      |
| 102    | 69   | 45    | 65   | 403   | 144  |      | 7    | 732   | 5    | 1    |      | 50   |      |      |      |
| 103    | 67   | 17    | 29   | 602   | 210  |      |      | 1262  | 2    | 1    |      | 50   |      |      |      |
| 104    | 20   | 17    | 32   | 368   | 163  |      |      | 613   | 5    | 1    |      | 50   |      |      |      |
| 105    | 60   | 15    | 15   | 495   | 14   |      |      | 894   | 2    | 1    |      | 50   |      |      |      |
| 106    | 16   | 16    | 41   | 384   | 289  |      | 4    | 501   | 9    | 0    |      | 55   |      |      |      |
| 107    | 87   | 12    | 10   | 277   | 172  |      |      | 430   | 4    | 0    |      | 73   |      |      |      |
| 108    | 25   | 15    | 10   | 315   | 96   |      |      | 628   | 3    | 0    |      | 62   |      |      |      |
| 109    | 15   | 4     | 96   | 423   | 83   |      |      | 736   | 5    | 0    |      | 57   |      |      |      |
| 110    | 38   | 7     | 172  | 421   | 109  |      |      | 789   | 3    | 0    |      | 47   |      |      |      |
| 111    | 27   | 24    | 323  | 372   | 10   |      |      | 800   | 2    | 0    |      | 24   |      |      |      |
| 112    | 20   | 239   | 294  | 207   | 61   |      |      | 1003  | 3    | 0    |      | 20   |      |      |      |
| 113    | 25   | 42    | 99   | 501   | 15   |      |      | 939   | 7    | 0    |      | 23   |      |      |      |
| 114    | 56   | 14    | 136  | 342   | 458  |      |      | 1003  | 5    | 0    |      | 23   |      |      |      |
| 115    | 53   | 14    | 213  | 209   | 48   |      |      | 939   | 13   | 0    |      | 23   |      |      |      |
| 116    | 135  | 48    | 216  | 230   | 384  |      |      | 588   | 21   | 0    |      | 23   |      |      |      |
| 117    | 130  | 19    | 127  | 295   | 32   |      |      | 411   | 8    | 0    |      | 23   |      |      |      |
| 118    | 125  | 5     | 185  | 343   | 1    |      |      | 567   | 11   | 0    |      | 23   |      |      |      |
| 119    | 43   | 4     | 112  | 308   | 13   |      |      | 422   | 11   | 0    |      | 23   |      |      |      |
| 120    | 64   | 4     | 102  | 303   | 13   |      |      | 422   | 11   | 0    |      | 23   |      |      |      |
| 121    | 34   | 8     | 98   | 382   | 52   |      |      | 656   | 9    | 1    |      | 23   |      |      |      |
| 122    | 60   | 8     | 98   | 411   | 148  |      | 3    | 656   | 9    | 1    |      | 23   |      |      |      |
| 123    | 40   | 40    | 9    | 496   | 112  |      |      | 656   | 8    | 1    |      | 23   |      |      |      |
| 124    | 56   | 56    | 33   | 504   | 148  |      |      | 732   | 8    | 1    |      | 23   |      |      |      |
| 125    | 43   | 43    | 33   | 504   | 148  |      |      | 732   | 8    | 1    |      | 23   |      |      |      |
| TTL    | 3231 | 10400 | 3482 | 10581 | 3356 | 426  | 23   | 31499 | 10   | 33   | 11   | 33   | 10   | 1    | 0    |

TABLE B-5. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE EO RATING

| EO<br>2 WEEK<br>PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      | MAN-HOURS BY FUNCTION |      |                       |      |      | MAN-HOURS BY FUNCTION |      |      |      |      |
|------------------------|-----------------------|------|------|------|------|-----------------------|------|-----------------------|------|------|-----------------------|------|------|------|------|
|                        | ADMN                  | ANAL | DSGN | DVLP | MUJA | EVAL                  | TRNG | MAN-<br>HOUR<br>TOTAL | ADMN | ANAL | DSGN                  | DVLP | MUJA | EVAL | TRNG |
| 12                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 13                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 14                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 15                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 16                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 17                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 18                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 19                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 20                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 21                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 22                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 23                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 24                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 25                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 26                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 27                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 28                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 29                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 30                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 31                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 32                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 33                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 34                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 35                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 36                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 37                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 38                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 39                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 40                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 41                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 42                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 43                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 44                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 45                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 46                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 47                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 48                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 49                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 50                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 51                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 52                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 53                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 54                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 55                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 56                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 57                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 58                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 59                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 60                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 61                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 62                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 63                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 64                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 65                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 66                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 67                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 68                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 69                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |
| 70                     |                       |      |      |      |      |                       |      |                       |      |      |                       |      |      |      |      |

TABLE B-5. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE EO RATING (continued)

| PERIOD | ADMN | ANAL | DSGN | DVLP | MDIA | EVAL | TRNG | TOTAL | ADMN | ANAL | DSGN | DVLP | MDIA | EVAL | TRNG |
|--------|------|------|------|------|------|------|------|-------|------|------|------|------|------|------|------|
| 71     | 8    | 9    |      |      |      |      |      | 17    | 47   | 52   |      |      |      |      |      |
| 72     | 30   | 41   |      |      |      |      |      | 71    | 42   | 57   |      |      |      |      |      |
| 73     | 6    | 94   |      |      |      |      |      | 100   | 6    | 94   |      |      |      |      |      |
| 74     | 8    | 107  |      |      |      |      |      | 115   | 12   | 93   |      |      |      |      |      |
| 75     | 9    | 66   |      |      |      |      |      | 75    | 24   | 88   |      |      |      |      |      |
| 76     | 20   | 61   |      |      |      |      |      | 81    | 22   | 75   |      |      |      |      |      |
| 77     | 26   | 87   |      |      |      |      |      | 116   | 21   | 68   |      |      |      |      |      |
| 78     | 25   | 55   |      |      |      |      |      | 80    | 21   | 78   |      |      |      |      |      |
| 79     | 17   | 63   |      |      |      |      |      | 95    | 24   | 75   |      |      |      |      |      |
| 80     | 23   | 72   |      |      |      |      |      | 143   | 28   | 71   |      |      |      |      |      |
| 81     | 41   | 102  |      |      |      |      |      | 88    | 15   | 90   |      |      |      |      |      |
| 82     | 8    | 80   |      |      |      |      |      | 133   | 14   | 84   |      |      |      |      |      |
| 83     | 21   | 112  |      |      |      |      |      | 107   | 17   | 94   |      |      |      |      |      |
| 84     | 16   | 91   |      |      |      |      |      | 96    | 17   | 82   |      |      |      |      |      |
| 85     | 5    | 91   |      |      |      |      |      | 148   | 13   | 86   |      |      |      |      |      |
| 86     | 26   | 122  |      |      |      |      |      | 152   | 35   | 63   |      |      |      |      |      |
| 87     | 20   | 132  |      |      |      |      |      | 192   | 23   | 29   |      |      |      |      |      |
| 88     | 27   | 49   |      |      |      |      |      | 297   | 11   | 47   |      |      |      |      |      |
| 89     | 46   | 122  |      |      |      |      |      | 106   | 17   | 9    |      |      |      |      |      |
| 90     | 34   | 89   |      |      |      |      |      | 140   | 16   | 71   |      |      |      |      |      |
| 91     | 44   | 130  |      |      |      |      |      | 34    | 16   | 24   |      |      |      |      |      |
| 92     | 19   | 100  |      |      |      |      |      | 533   | 12   | 29   |      |      |      |      |      |
| 93     | 56   | 185  |      |      |      |      |      | 294   | 16   | 56   |      |      |      |      |      |
| 94     | 49   | 167  |      |      |      |      |      | 459   | 11   | 23   |      |      |      |      |      |
| 95     | 41   | 150  |      |      |      |      |      | 355   | 21   | 16   |      |      |      |      |      |
| 96     | 49   | 165  |      |      |      |      |      | 275   | 11   | 16   |      |      |      |      |      |
| 97     | 54   | 15   |      |      |      |      |      | 333   | 16   | 17   |      |      |      |      |      |
| 98     | 80   | 86   |      |      |      |      |      | 42    | 17   | 7    |      |      |      |      |      |
| 99     | 10   | 44   |      |      |      |      |      | 740   | 11   | 1    |      |      |      |      |      |
| 100    | 32   | 48   |      |      |      |      |      | 858   | 8    | 7    |      |      |      |      |      |
| 101    | 49   | 62   |      |      |      |      |      | 656   | 11   |      |      |      |      |      |      |
| 102    | 56   | 36   |      |      |      |      |      | 722   | 22   |      |      |      |      |      |      |
| 103    | 32   | 51   |      |      |      |      |      | 519   | 27   |      |      |      |      |      |      |
| 104    | 48   | 8    |      |      |      |      |      | 433   | 20   |      |      |      |      |      |      |
| 105    | 32   | 51   |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 106    | 48   | 8    |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 107    | 58   | 74   |      |      |      |      |      | 43    | 18   |      |      |      |      |      |      |
| 108    | 78   | 49   |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 109    | 171  | 171  |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 110    | 41   | 91   |      |      |      |      |      | 43    | 28   |      |      |      |      |      |      |
| 111    | 91   | 91   |      |      |      |      |      | 43    | 8    |      |      |      |      |      |      |
| 112    | 95   | 95   |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 113    | 62   | 62   |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 114    | 34   | 34   |      |      |      |      |      | 43    | 18   |      |      |      |      |      |      |
| 115    | 140  | 140  |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 116    | 25   | 25   |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 117    | 19   | 19   |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 118    | 24   | 24   |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 119    | 196  | 196  |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 120    | 114  | 114  |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 121    | 123  | 123  |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 122    | 108  | 108  |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 123    | 39   | 39   |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| 124    |      |      |      |      |      |      |      | 43    | 14   |      |      |      |      |      |      |
| 125    |      |      |      |      |      |      |      | 43    | 21   |      |      |      |      |      |      |
| TTL    | 2877 | 2854 | 2608 | 7255 | 272  | 905  | 43   | 16814 | 17   | 16   | 15   | 43   | 1    | 5    | 0    |

TABLE B-6. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE DP RATING

| DP | 2 WEEK<br>PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      | MAN-<br>HOUR<br>TOTAL | MAN-HOURS BY FUNCTION |       |      |      |      |      |
|----|------------------|-----------------------|------|------|------|------|-----------------------|-----------------------|-------|------|------|------|------|
|    |                  | ADMIN                 | ANAL | DSGN | DVLP | MDIA |                       | TRNG                  | ADMIN | ANAL | DSGN | DVLP | MDIA |
|    | 12               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 13               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 14               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 15               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 16               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 17               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 18               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 19               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 20               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 21               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 22               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 23               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 24               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 25               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 26               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 27               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 28               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 29               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 30               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 31               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 32               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 33               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 34               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 35               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 36               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 37               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 38               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 39               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 40               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 41               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 42               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 43               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 44               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 45               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 46               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 47               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 48               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 49               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 50               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 51               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 52               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 53               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 54               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 55               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 56               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 57               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 58               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 59               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 60               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 61               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 62               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 63               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 64               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 65               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 66               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 67               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 68               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 69               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    | 70               |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |
|    |                  |                       |      |      |      |      |                       |                       |       |      |      |      |      |

TABLE B-5. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE DP RATING (continued)

| PERIOD | ADMIN | ANAL  | DSGN | DVLP  | MDIA | EVAL | TRNG | TOTAL | ADMIN | ANAL | DSGN | DVLP | MDIA | EVAL | TRNG |
|--------|-------|-------|------|-------|------|------|------|-------|-------|------|------|------|------|------|------|
| 71     | 42    | 383   |      |       |      |      |      | 425   | 9     | 90   |      |      |      |      |      |
| 72     | 76    | 511   |      |       |      |      |      | 587   | 12    | 87   |      |      |      |      |      |
| 73     | 126   | 360   |      |       |      |      |      | 486   | 25    | 74   |      |      |      |      |      |
| 74     | 78    | 721   |      |       |      |      |      | 821   | 9     | 87   |      |      |      |      |      |
| 75     | 108   | 812   |      | 22    |      |      |      | 921   | 11    | 88   |      | 2    |      |      |      |
| 76     | 64    | 693   |      | 1     |      |      |      | 757   | 8     | 91   |      | 0    |      |      |      |
| 77     | 86    | 550   |      |       |      |      |      | 636   | 13    | 86   |      |      |      |      |      |
| 78     | 44    | 697   |      |       |      |      |      | 741   | 5     | 94   |      |      |      |      |      |
| 79     | 44    | 305   |      |       |      |      |      | 349   | 12    | 87   |      |      |      |      |      |
| 80     | 111   | 466   |      |       |      |      |      | 589   | 18    | 79   |      |      |      |      |      |
| 81     | 148   | 465   |      |       |      |      |      | 842   | 17    | 55   |      |      |      |      |      |
| 82     | 148   | 420   |      |       |      |      |      | 854   | 17    | 49   |      |      |      |      |      |
| 83     | 129   | 510   |      |       |      |      |      | 779   | 16    | 65   |      |      |      |      |      |
| 84     | 131   | 567   |      |       |      |      |      | 838   | 15    | 67   |      |      |      |      |      |
| 85     | 211   | 538   |      |       |      |      |      | 902   | 30    | 59   |      |      |      |      |      |
| 86     | 182   | 637   |      |       |      |      |      | 921   | 19    | 69   |      |      |      |      |      |
| 87     | 182   | 363   |      |       |      |      |      | 768   | 25    | 47   |      |      |      |      |      |
| 88     | 129   | 384   |      |       |      |      |      | 753   | 23    | 50   |      |      |      |      |      |
| 89     | 212   | 424   |      |       |      |      |      | 886   | 23    | 47   |      |      |      |      |      |
| 90     | 104   | 473   |      |       |      |      |      | 797   | 12    | 69   |      |      |      |      |      |
| 91     | 100   | 544   |      |       |      |      |      | 751   | 12    | 72   |      |      |      |      |      |
| 92     | 118   | 594   |      |       |      |      |      | 751   | 15    | 80   |      |      |      |      |      |
| 93     | 93    | 335   |      |       |      |      |      | 631   | 14    | 53   |      |      |      |      |      |
| 94     | 126   | 268   |      |       |      |      |      | 772   | 22    | 34   |      |      |      |      |      |
| 95     | 124   | 365   |      |       |      |      |      | 563   | 22    | 64   |      |      |      |      |      |
| 96     | 92    | 615   |      |       |      |      |      | 765   | 14    | 59   |      |      |      |      |      |
| 97     | 95    | 383   |      |       |      |      |      | 644   | 10    | 68   |      |      |      |      |      |
| 98     | 70    | 435   |      |       |      |      |      | 639   | 3     | 45   |      |      |      |      |      |
| 99     | 23    | 291   |      |       |      |      |      | 446   | 12    | 12   |      |      |      |      |      |
| 100    | 100   | 100   |      |       |      |      |      | 803   | 3     | 9    |      |      |      |      |      |
| 101    | 30    | 80    |      |       |      |      |      | 869   | 3     | 9    |      |      |      |      |      |
| 102    | 27    | 67    |      |       |      |      |      | 685   | 10    | 9    |      |      |      |      |      |
| 103    | 71    | 66    |      |       |      |      |      | 708   | 8     | 8    |      |      |      |      |      |
| 104    | 65    | 152   |      |       |      |      |      | 785   | 10    | 8    |      |      |      |      |      |
| 105    | 60    | 45    |      |       |      |      |      | 600   | 10    | 7    |      |      |      |      |      |
| 106    | 34    | 70    |      |       |      |      |      | 737   | 4     | 9    |      |      |      |      |      |
| 107    | 122   | 64    |      |       |      |      |      | 884   | 13    | 7    |      |      |      |      |      |
| 108    | 39    | 74    |      |       |      |      |      | 1044  | 3     | 6    |      |      |      |      |      |
| 109    | 58    | 62    |      |       |      |      |      | 985   | 5     | 7    |      |      |      |      |      |
| 110    | 42    | 70    |      |       |      |      |      | 991   | 4     | 7    |      |      |      |      |      |
| 111    | 59    |       |      |       |      |      |      | 1004  | 3     | 7    |      |      |      |      |      |
| 112    | 166   | 5     |      |       |      |      |      | 1094  | 14    | 0    |      |      |      |      |      |
| 113    | 181   |       |      |       |      |      |      | 1108  | 16    |      |      |      |      |      |      |
| 114    | 70    |       |      |       |      |      |      | 863   | 13    |      |      |      |      |      |      |
| 115    | 191   |       |      |       |      |      |      | 1438  | 16    |      |      |      |      |      |      |
| 116    | 99    |       |      |       |      |      |      | 1021  | 9     |      |      |      |      |      |      |
| 117    | 106   |       |      |       |      |      |      | 1018  | 10    |      |      |      |      |      |      |
| 118    | 49    |       |      |       |      |      |      | 878   | 5     |      |      |      |      |      |      |
| 119    | 89    |       |      |       |      |      |      | 889   | 10    |      |      |      |      |      |      |
| 120    | 187   |       |      |       |      |      |      | 1204  | 15    |      |      |      |      |      |      |
| 121    | 127   |       |      |       |      |      |      | 998   | 12    |      |      |      |      |      |      |
| 122    | 84    |       |      |       |      |      |      | 1015  | 8     |      |      |      |      |      |      |
| 123    | 152   |       |      |       |      |      |      | 1164  | 5     |      |      |      |      |      |      |
| 124    | 45    |       |      |       |      |      |      | 849   | 12    |      |      |      |      |      |      |
| 125    |       |       |      |       |      |      |      | 49853 | 12    |      |      |      |      |      |      |
| TTL    | 6023  | 19059 | 4809 | 15478 | 2651 | 816  | 1017 | 49853 | 12    | 38   | 9    | 31   | 5    | 1    | 2    |

TABLE B-7. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE SA RATING

| SA<br>2 WEEK<br>PERIOD | MAN-HOURS BY FUNCTION |      |      |      |      |      | MAN-<br>HOUR<br>TOTAL | % MAN-HOURS BY FUNCTION |      |      |      |      |      |
|------------------------|-----------------------|------|------|------|------|------|-----------------------|-------------------------|------|------|------|------|------|
|                        | ADMN                  | ANAL | DSGN | DVLP | MDTA | TRNG |                       | ADMN                    | ANAL | DSGN | DVLP | MDTA | TRNG |
| 12                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 13                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 14                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 15                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 16                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 17                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 18                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 19                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 20                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 21                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 22                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 23                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 24                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 25                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 26                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 27                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 28                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 29                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 30                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 31                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 32                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 33                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 34                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 35                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 36                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 37                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 38                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 39                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 40                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 41                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 42                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 43                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 44                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 45                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 46                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 47                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 48                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 49                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 50                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 51                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 52                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 53                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 54                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 55                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 56                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 57                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 58                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 59                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 60                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 61                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 62                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 63                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 64                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 65                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 66                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 67                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 68                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 69                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |
| 70                     |                       |      |      |      |      |      |                       |                         |      |      |      |      |      |



TABLE B-7. DISTRIBUTION OF LABOR AMONG THE ISD FUNCTIONS FOR EACH PAY PERIOD (1976 to 1980) FOR THE DEVELOPMENT OF THE SA RATING (continued)

| PERIOD | ADMIN | ANAL | DSGN | DVLP  | MUJA | EVAL | TRNG | TOTAL | ADMIN | ANAL | DSGN | DVLP | MUJA | EVAL | TRNG |
|--------|-------|------|------|-------|------|------|------|-------|-------|------|------|------|------|------|------|
| 71     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 72     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 73     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 74     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 75     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 76     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 77     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 78     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 79     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 80     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 81     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 82     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 83     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 84     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 85     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 86     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 87     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 88     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 89     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 90     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 91     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 92     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 93     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 94     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 95     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 96     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 97     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 98     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 99     |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 100    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 101    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 102    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 103    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 104    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 105    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 106    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 107    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 108    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 109    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 110    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 111    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 112    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 113    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 114    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 115    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 116    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 117    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 118    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 119    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 120    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 121    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 122    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 123    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 124    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| 125    |       |      |      |       |      |      |      |       |       |      |      |      |      |      |      |
| TTL    | 5101  | 1297 | 1651 | 15263 | 6437 | 2155 | 196  | 32100 | 15    | 4    | 5    | 47   | 20   | 6    | 0    |

TABLE B-8. PERCENT OF CIVILIAN AND MILITARY LABOR DEVOTED TO EACH ISD FUNCTIONAL AREA--SAN DIEGO (1976 to 1980)

| Year | Admin |     | Analysis |     | Design |     | Development |     | Media |     | Other |     |
|------|-------|-----|----------|-----|--------|-----|-------------|-----|-------|-----|-------|-----|
|      | Civ   | Mil | Civ      | Mil | Civ    | Mil | Civ         | Mil | Civ   | Mil | Civ   | Mil |
| 1976 | 61    | 53  | 15       | 45  | 4      | 0   | 7           | 0   | 1     | 0   | 12    | 2   |
| 1977 | 61    | 50  | 10       | 43  | 4      | *   | 12          | 3   | 8     | 2   | 4     | 1   |
| 1978 | 57    | 49  | 12       | 39  | 4      | *   | 17          | 6   | 4     | 1   | 5     | 5   |
| 1979 | 60    | 46  | 8        | 27  | 5      | 10  | 17          | 14  | 6     | 1   | 4     | 2   |
| 1980 | 56    | 43  | 3        | 9   | 5      | 8   | 25          | 33  | 7     | 4   | 4     | 3   |
| Avg. | 59    | 47  | 9        | 30  | 5      | 5   | 17          | 13  | 6     | 2   | 5     | 3   |

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